

THE
FERN BULLETIN

A Quarterly Devoted to Ferns

EDITED BY WILLARD N. CLUTE

VOLUME XI

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Dr M. A. Howe

Register of H. D. Howe

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No. 1.

The Fern Bulletin.

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JANUARY

Binghamton, N. Y.
THE FERN BULLETIN CO.
1903

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A QUARTERLY DEVOTED TO FERNS

WILLARD N. CLUTE, Editor

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JAMES ANSEL GRAVES

THE FERN BULLETIN

VOL. XI.

JANUARY, 1903.

No. 1

THE FERN FLORA OF LOUISIANA.

BY WILLARD N. CLUTE AND R. S. COCKS.

Of all the States that border the Gulf of Mexico, Louisiana seems to have received the least attention from collectors. Half a century or more ago, botanists like Hale, Riddell, Drummond and Carpenter were active in making the flora known, but more recently less has been written regarding it. Although several botanists, among whom the late A. B. Langlois and Dr. Joor were prominent, have since been engaged in studying the plants, their neglect to publish their observations or to distribute specimens has prevented a wider knowledge of the facts.

The ferns and fern allies probably received even less study than the flowering plants. With the exception of Langlois' Catalogue of the Plants of Louisiana, published in 1886, there have been no recent publication on the flora of the region. The first published list of Louisiana plants that we have been able to find is C. C. Robin's "Florula Ludoviciana," published in 1803, and revised and enlarged by Rafinesque in 1817. In this list are to be found *Adiantum pedatum*, *Asplenium ebeneum*, *Osmunda spectabilis* and *Equisetum praealtum*. Next to this comes the "Catalogus Florae Ludovicianæ," by J. L. Riddell, contributed to the *New Orleans Medical and Surgical Journal* for May, 1852. This is abridged from an annotated manuscript work entitled "Plants of Louisiana," contributed by Riddell to the Smithsonian Institution in 1861 and based upon specimens in his own herbarium. All trace of this work seems lost at present, and we are therefore uncertain what ferns are indicated by *Dryopteris aureliana* (No. 1784) and *Lastræ petiolata* (1785). In 1869-70 Prof. A. Featherman, of the Louisiana State University, prepared a list of the flowering plants and ferns of the State which was also sent to the Smithsonian Institution. This list was never published.

The State probably contains fewer species of ferns than any other Southern State. The surface is but little elevated above sea level, the highest portion being in the northern and western part. In the south, vast and impassable cypress swamps, intersected by sluggish streams and bayous, that make collecting in this region exceedingly difficult, stretch away toward the Gulf. Curiously enough, although ferns love moisture, there are comparatively few ferns in the swamps. The two flowering ferns (*Osmunda*) and an occasional marsh fern (*Nephrodium*) seem to be about the only inhabitants. The drier ground is usually sandy and covered with pine forests, in which a rich vegetation flourishes. While the summers are warm and the autumns mild, the winters in Louisiana are much colder than in other parts of the United States in the same latitude, and for this reason the State will never rival Florida in the number of tropical species recorded, though possibly a few more remain to be discovered near the coast, such as *Polypodium aurcum*, *Vitaria lineata*, *Pteris caudata*, and *Lycopodium cernuum*. The principal collecting of the State has been done in the vicinity of New Orleans. When the plants of the northwestern portion are better known, we may expect a few more northern species to be added to the list, such as *Polypodium vulgare*, *Nephrodium noveboracense*, *N. cristatum*, *N. maginale*, and *Cystopteris fragilis*. The almost total lack of rock outcrops will always make rock-loving species rare. At present there is not an *Isoetes* known to grow in the State.

Up to the present, twenty-seven ferns and eight allies have been recorded from the State. The species in the following list are all represented in the herbarium of R. S. Cocks unless otherwise stated. Additions and corrections to the list will be gladly received by the authors.

OPHIOGLOSSACEÆ.

Ophioglossum vulgatum L. ADDER'S-TONGUE. Very rare. The form now called *Engelmanni* was long ago collected by Dr. Hale at Natchitoches, in April.

Ophioglossum pusillum Nutt. Very rare. This species was recorded from New Orleans in 1833 by Drummond. Apparently not since collected.

Ophioglossum crotalophoroides Walt. Very rare. This species was also recorded from New Orleans by Drummond and not since collected, unless two or three specimens in the Herbarium of Tulane University, marked "Vide Flora, West Louisiana," in the handwriting of Dr. Hale are from the State.

Botrychium obliquum Muhl. COMMON GRAPE FERN. Not uncommon in moist shades. Sterile fronds not referable to *B. biternatum* were collected by W. N. Clute at Pearl River in 1902.

Botrychium biternatum Und. Very rare. Referred to Louisiana upon the authority of a single specimen collected by Drummond. Prof. Cocks in several years' collecting has not found it. It is reported to fruit in March and April.

Botrychium Virginianum Sw. RATTLESNAKE FERN. Common in woods.

OSMUNDACEÆ.

Osmunda regalis L. FLOWERING FERN. Very abundant in wet places.

Osmunda cinnamomea L. CINNAMON FERN. Very abundant, growing with the preceding.

CERATOPTERIDACEÆ.

Ceratopteris thalictroides Brong. FLOATING FERN. First recorded from Louisiana by W. N. Clute, who collected it at West End, near New Orleans, in October, 1901. This species was collected earlier near this station by Dr. J. M. Joor (1892), but not reported. R. S. Cocks collected it rooting in mud shortly after Dr. Joor collected it, and again at the same station in the autumn of 1902. Probably it will be found to be more abundant than it is now known to be.

POLYPODIACEÆ.

Polypodium incanum Sw. GRAY POLYPODY. Abundant on the trunks and main branches of trees, especially live oaks.

Adiantum Capillus-Veneris L. VENUS-HAIR FERN. Plentiful on the walls of Girod street cemetery in New Orleans. Possibly the only station.

Adiantum pedatum L. MAIDEN-HAIR FERN. Riddell lists this species but no recent specimens have been seen. The plant may

be expected from the northern part of the State, as it is not uncommon in Mississippi. In the Herbarium of Tulane University are specimens labelled "Flora of West Louisiana, Hale, 1849."

Pteris longifolia L. Abundant on the walls of most of the cemeteries in New Orleans and apparently well established. First reported from the State by W. N. Clute in 1902.

Pteris serrulata L. f. Well naturalized on the walls of Girod street cemetery, New Orleans. Discovered by W. N. Clute. Reported from Louisiana as an escape, by Langlois in 1886.

Pteris aquilina L. BRACKEN. Common in dry shades.

Pteris aquilina pseudocaudata Clute. Abundant in the pine barrens. The prevailing form.

Woodwardia Virginica J. E. Smith. COMMON CHAIN-FERN. Very common in all wet pine barrens.

Woodwardia angustifolia J. E. Smith. NARROW-LEAVED CHAIN-FERN. With the preceding and about as abundant.

Asplenium ebencum Ait. EBONY SPLEENWORT. Common in dryish shades.

Athyrium thelypteroides Desv. SILVERY SPLEENWORT. Reported by Riddell and apparently not since collected. Has been found in Georgia and Alabama and may possibly occur in the northern part of the State.

Athyrium filix-foemina Roth. LADY FERN. Not uncommon in moist shades.

Polystichum acrostichoides Schott. CHRISTMAS FERN. Common in the forests of deciduous trees.

Nephrodium thelypteris L. MARSH FERN. Fairly common though not so plentiful as might be supposed in view of the swampy character of much of the State.

Nephrodium patens Desv. SWEET FERN. Abundant in moist woods and the borders of fields.

Nephrodium Floridanum Hook. Inserted here on the authority of Dr. Charles Mohr, who collected in Louisiana and who possessed Riddell's herbarium.

Phegopteris hexagonoptera Fee. BROAD BEECH FERN. Somewhat rare. Found on shaded banks.

Onoclea sensibilis L. SENSITIVE FERN. Not uncommon, but less abundant than the nature of the soil would indicate. R. S.

Cocks has found immense quantities of this fern about fifteen miles west of New Orleans.

MARSILIACEÆ.

Marsilia uncinata A. Br. Abundant along the Mississippi especially in the vicinity of New Orleans where it fills the ditches in the outskirts and often completely overruns the streets.

SALVINIACEÆ.

Azolla Caroliniana Willd. WATER FERN. Exceedingly abundant in stagnant pools, thickly covering the surface.

EQUISETACEÆ.

Equisetum robustum A. Br. SCOURING RUSH. Common in wet places.

Equisetum laevigatum A. Br. This is usually credited to Louisiana and the description of the species is said to have been founded in part upon material from this State; but neither Ridell nor Langlois catalogue it, and it has possibly been wrongly referred to Louisiana.

LYCOPODIACEÆ.

Lycopodium alopecuroides L. FOX-TAIL CLUB-MOSS. Common in moist spots in the pine barrens. The form called variously *adpressum* and *Chapmani* was collected at Lake Charles by S. M. Tracy. *Lycopodium inundatum* L. has several times been reported from the State, but as this is a Northern species it is evident that the form *adpressum* has been mistaken for it.

Lycopodium Carolinianum L. Not uncommon in wet pine barrens. Collected by R. S. Cocks at Slidell and Ponchatoulas.

——*Lycopodium clavatum* L. has been reported from the State, and there is a sheet of it in the Herbarium of Tulane University, labelled, "Flora of Louisiana, legit Josiah Hale, 1849." This, however, is far beyond the accepted range of the species and the label is doubtless incorrect.

SELAGINELLACEÆ.

Selaginella apus Spring. CREEPING SELAGINELLA. Not uncommon in moist places.

Selaginella Ludoviciana A. Br. Reported from Covington, Mandeville, Pearl River, Ponchatoulas and the environs of New Orleans.

MY INDOOR FERNERY.

By C. E. WATERS.

One of the pleasures connected with ferns is that we may study them in our own homes if we take the trouble to construct a suitable dwelling for them. My own fernery is a rather rough affair, twenty-two by seventeen inches, and a foot high, with one side hinged at the top so that it may be opened readily. The base is made of five-eighths inch boards strongly fastened together by cross-pieces with the nails clinched. Upon this are nailed four strips of half-inch pine, forming a box two and a quarter inches deep that just fits inside of the glass cover. The inside of this was varnished, to protect the wood, and then a little mound of limestone and granite was made, and the whole was filled in with the richest earth obtainable in the woods.

When first made the case stood on edge, so to speak, being seventeen inches tall, but in winter the cheerless space between them and the top seemed to discourage the ferns. The present arrangement not only gives more space for planting, but there is less empty space above the ferns. It stands near an eastern window, and even on a winter morning, after an all night exposure to the cold air coming in, the inside of the fernery keeps warm with only an old woollen cover thrown over it. In summer a piece of thin paper is pasted over the front to keep off the direct rays of the sun, and the side is kept open an inch or two. Every week or two a quart or more of water is poured in, taking care to put plenty in the corners which are more apt to dry out than the center.

This sounds very rough and crude, but some ferns find it a congenial home. At present sixteen or seventeen species are growing more or less luxuriantly, and it is interesting to note their different behavior. The limits of this article forbid going into details, but the ferns that thrive best may be mentioned. Above all, *Asplenium Bradleyi*, *Nephrodium marginale*, *N. cristatum* and *Polystichum acrostichoides* are doing well, and a plant of *P. aureum* is almost a nuisance, for its broad fronds shade the ferns behind it. *Pellaea atropurpurea*, *Cheilanthes vestita* and *Asplenium ebeneum* do well, as does also *Cystopteris bulbifera*

and *Adiantum pedatum*. *Asplenium ruta-muraria* has sent out a few fronds, and *A. trichomanes* survives. The rare *A. viride*, *A. parvulum*, *Woodsia glabella*, and *W. hyperborea* languished and died. *Phegopteris Polypodioides*, a small ostrich fern, and *Nephrodium fragrans* are trying to get ahead, but with little success. The latter is very fragrant.

A number of other species, including some greenhouse ferns, have been tried in previous years. No "management" is necessary except what is stated above, only we are often obliged to cut out handfuls of fronds of some species to keep them from crowding the others out of existence.

Baltimore, Md.

THE GENUS *EQUISETUM* IN NORTH AMERICA.

BY A. A. EATON.

TWELFTH PAPER.

THE SUB-GENUS *HIPPOCHAETAE* MILDE.

Stems evergreen in whole or in part; normally unbranched (in ours), very variable in size, usually well covered with silix, either as a coating or in bands, tubercles, rosettes, etc. Stomata in a single regular row on each side of the ridges (in ours, with rare exceptions), sunk below the surface and covered by the silix coating, having access to the air through a small hole over each. Species mostly closely related and often difficult of determination.

While among the *Equiseta* there are no true varieties with the possible exception of *Arvense boreale*; the *Hippochaetae* consists of a multitude of races, of which the species as understood are centers of variation. The system obtaining in Europe is and has been to make species out of the connecting links, but a careful study of a large series of both our forms and theirs has convinced me that they are best treated as varieties.

E. variegatum Jesupi, and *E. trachyodon*, for instance, are almost exactly between *variegatum* and *hiemale*, and could properly be made varieties of that species. *Variegatum concolor* is exactly between *variegatum* and *laevigatum*, and but for other varieties with occasional rounded angles would be considered a

variety of the latter. *E. hiemale intermedium*, aside from anatomy, could hardly be separated from *laevigatum*, and there appears to be no good stopping place from *variegatum* through *Funstoni* to *ramosissimum*. *E. hiemale Schleicheri* of Europe runs into *ramosissimum*. The only species of which I have seen no intergrades is *scirpoides*, and this may be expected to run into *variegatum* when thoroughly hunted up. Indeed the European *variegatum anceps* has nearly the anatomy and size of *scirpoides*, and I have seen *scirpoides* from Scandinavia nearly as stout as *variegatum* from Russia.

The characters of diagnostic value are the nature of the sheaths, their teeth, the marks on the keels, whether in cross-bands or two rows of tubercles, the forms the silex covering take in the grooves, and the arrangement of the internal organs. The nature of the rib markings and internal organs is best shown by a cross-section. The stomata and general epidermal characters are well shown by taking a slice of the stem, wetting it, scraping off the parenchyma and then viewing by transmitted light. It may also be prepared by placing on a pinch of chlorate of potash and applying a drop of sulphuric acid, thus burning out all but the mineral part, but care must be used, as the substance is explosive. As stated at the beginning of these articles this section is sufficiently well characterized to be regarded as a genus. Among all other groups of plants genera are founded on comparatively slight differences. It is probable, as suggested by Milde, that the sub-genera represent two different stages in development, the *Hippochaetae* being the more primitive form and the *Equiseta* more highly specialized derivatives.

The subgenus itself is subdivided into several sub-sections, two of which are represented in our area. The first, consisting of *ramosissimum*, *Funstoni* and *laevigatum*, are characterized by mostly annual stems, long amplified sheaths whose teeth in falling leave persistent bases, by the branches, if any, developing normally at the same time as the stem itself, and by having the vallicular bast stouter than the carinal and separating the green parenchyma. The other, represented by *hiemale*, *robustum*, *variegatum* and *scirpoides*, has stems persistent three or four years, sheaths little if any longer than broad, tight to the stem;

teeth, when deciduous, not leaving a persistent base, branches if any developed by a subsequent effort after the death of the tip of the stem. *Variegatum* is intermediate between the sections in several respects, the internal structure being that of the first group, the external as a rule belonging to the second. These remarks as a whole have been drawn for our species, and entirely ignore extralimital species of the sub-genus.

E. RAMOSISSIMUM.—DESF.

Stems erect or decumbent, scattered or cespitose, naked or branched, 4 to 10 feet high, of exceedingly variable form, size and structure, most commonly 2-4 lines in diameter, with 10-26 rounded angles beset with cross-bands of silex of varying size and elevation, grooves broad and shallow with a series of stomata on each side, composed of 1-4 rows to a series; the space between them naked or variously covered with rosettes, circles or small bands of silex.

Sheaths mostly one-third longer than wide, gradually widening upward, green or of various shades of brown; leaves narrow, rounded or seldom slightly ridged below, at times with a small central groove above; teeth thin, the upper two-thirds deciduous, the rest firmer, white-bordered, persistent as a triangular lanceolate termination to the leaf; branches when present few or many, long or short, with much the structure of the stem. The first internode is always very short.

The central cavity occupies about two-thirds of the total diameter of the stem, the vallecular mostly small, transversely oblong. The arrangement of bast and green parenchyma varies according to size of the plant.

This species in some of its many forms is found around the world, mostly in tropical and sub-tropical regions. It is apparently very rare in America but is found from the western United State to Chile. The forms extending into the temperate regions are mostly small and the stomata in a single row; while Mexico is the only warm country that bears them so. Reported from British Columbia by Dr. Lyall, but the locality needs confirmation for three reasons: first, it has never been found there since 1849; second, its nearest relative on the south is 1,000 miles away,

third, there are several forms growing in that region that without accurate comparison would be referred to this species.

The only specimen I have seen from the United States was collected near Los Angeles, Cal., by Dr. A. Davidson (U. S. Nat. Herb Sheet, 25096). The plant, which is sterile, apparently belongs to *var. annuliferum* Milde and may be characterized as follows: Cespitose, 4-10 inches high; 8-10 angled; ridges very rough, with cross-bands of silex, the grooves with 1-2 lines of stomata in a series, and with rosulae in bands or scattered; branches near base, few and short; sheaths green, long, amplified, keeled below; grooved in center near tip. Teeth brown centrally, the persistent bases fading and becoming papery.

E. FUNSTONI, SP. NOV.

For several years there has been collected and distributed from Southern California a peculiar Equisetum, under the name of *E. Mexicanum* Milde. This name was given by Milde to a fragment 15 inches long in Herb. Monacense, collected in Mexico by Karwinski. Later he reduced this to a form of *ramosissimum* and (Mon. 504) transferred the name to an entirely different thing related to *giganteum* if not identical as Baker holds. As the plant in hand does not agree with either description I have proposed to name it *Funstoni* as commemorative of the time when the distinguished General was as active in botanical as he now is in military affairs.

Plant of various aspect; a few inches to two and one-half feet high, prostrate or erect, 1 to 5 lines in diameter, naked or branched, mostly very rough, especially the smaller stems, 10-30 ribbed. Ridges with many transverse thin, usually much elevated bands of silex, the grooves with short bands and points. Stomata single or double rowed. Sheaths elongated, moderately amplified, usually incurved at limb, ridged in the center through nearly the entire length, becoming flat above, the edges rising into ridges or in smaller stems rounded, concolorous with the stem black or brown in various degrees, often fading to white, rarely with a basal black ring. Teeth membranous, often cohering and pushed off by the growth of the stem, like a candle-extinguisher as in most *hiemale* varieties, leaving a long or small persistent, black,

horny, centrally-grooved, white-margined base, narrower than the leaf, the tips soon incurving, the whole forming a narrow black and white limb to the sheath.

Uppermost sheath broadly campanulate; spike included or a little exerted, rounded at top, not apiculate as in the rest of the sub-genus. Central cavity occupying four-fifths the diameter of the stem, but not so wide as *laevigatum*; carinal and vallecular small and at times obsolete for a short distance, the inner points of carinal and vallecular bast about equidistant from the central cavity, the green parenchyma continuous under both carinal and vallecular bast, the internal arrangement being similar to *ramosissimum*. Parenchyma of sheaths in an oblong mass over the bast, which occupies the place of the carinal cavity.

Similar to both *laevigatum* and *ramosissimum* and naturally comes between them. Differs from the former, with which it is most likely to be confounded in its extreme roughness, shorter sheaths, prominently incurved bases of the teeth, the stomata often in two rows, the stem walls thicker and the green parenchyma continuous. The carinal bast equals the vallecular, the green parenchyma of the sheaths is massed, and the sheaths in section are prominently 3-angled.

This species has been collected under the following forms:

1. *Caespitosum*. Stems up to 10 inches high, small, erect or prostrate, usually persisting over winter, sometimes 100 in a cluster, very rough; teeth persistent, becoming white; bases at first variegated black and white, finally fading to white. Leaves rounded on the back. Resembles *laevigatum variegatoides*. Wash of the Santa Ana River 2 miles west of San Bernardino, December 27, 1890, *Coville* and *Funston*, No. 13; *Parish* 16,668c. National City, Calif., *Miss L. F. Kimball*.

2. *Nudum*. Stems 1 to 2 feet high, about 20-angled, erect, naked. The common form with aspect of *laevigatum*. San Bernardino *Coville* and *Funston*, No. 13 (*E. robustum* Cont. Nat. Herb. IV, 226). San Bernardino, *Parish* 2,058 and 16,668. One mile east of San Bernardino, *Coville* and *Funston*, No. 27 as *E. variegatum* l. c); Pasadena *Parish*, National City, Cal. *Miss Kimball*. Panamint Valley *Coville* and *Funston*, 689 as *E. variegatum* l. c. (Somewhat variant; Johnson Canyon, Panamint Mts.,

Coville and Funston, 531 as *E. variegatum* l. c.; Matiliji Canyon, border of brooks, Apr. 25, 1886; Ojai, S. Califf.—C. F. Peckham.

3. *Ramosum*, 1 to 2 feet high with regular verticils of branches developing at time of fruiting, ultimately attaining a length of 12-15 inches. San Bernardo Parish 16668b, Coville and Funston. No. 13 Los Angeles, Dr. A. Davidson, differs in having the laves bearing a carinal groove. This species and *laevigatum* show their relationship to *ramosissimum* by developing branches on stems of the year, while the species of the *hiemale* group rarely do so.

4. *Polystachyum*. Branches ending in spikelets. Often caused by injuries to the main axis. Parish 16,668a.

These notes have been drawn largely from material in the National Herbarium.

In the October BULLETIN, at the bottom of page 121, I stated that Milde certainly, and A. Braun probably, based their descriptions of *E. laevigatum* on this plant. This statement should be qualified by inserting "in part" after "*laevigatum*."—A. A. Eaton.

FERNWORT NOTES.—I.

BY WILLARD N. CLUTE.

FRAGRANCE OF POLYPODIUM PUSTULATUM.—While opening a bundle of these ferns, recently, their strong and agreeable fragrance instantly reminded me of Mr. George E. Smith's observation concerning them in the October FERN BULLETIN. Although my specimens were collected more than fifteen years ago, the odor is still very noticeable and quite unlike anything in the line of perfumes that I remember. Its lasting qualities and uncommon odor would seem worth exploiting by the perfumer.

LYCOPodium LUCIDULUM ON THE PACIFIC COAST.—A year or more ago I received from Mr. J. B. Flett some specimens of a club-moss, collected at the base of Mt. Ranier, Washington, which he had referred, with some doubts, to *Lycopodium selago*. It needed but a glance to show that the plants were more nearly related to *L. lucidulum*, and had this species been expected so far west, Mr. Flett would undoubtedly have correctly named them.

Until the present the western range of *L. lucidulum* was supposed to end in Minnesota, but there is no doubt that the Mt. Ranier specimens are properly referred to this species. There are, however, slight differences in form. The leaves are thinner, less strongly nerved, less sharply pointed, and, in all specimens that I have seen, lack the toothing toward the tips, that is characteristic of the eastern form. I would therefore call it forma *occidentale*, and name as the type, a specimen in my herbarium collected by J. B. Flett, August 15, 1901, near the base of Mt. Ranier, Wash. (No. 1905). It is interesting to note in this connection that the Japanese *L. serratum* differs about as much from our *L. lucidulum* in the toothing of the leaves, as the latter differs from *occidentale*.

NAME OF THE JAPANESE POLYPODY.—Mr. Maxon's opinion that the Japanese polypody is distinct from our common *P. vulgare* is likely to be subscribed to by all who have had an opportunity of comparing specimens of both; in fact it was considered a good species long before Mr. Maxon gave it the name of *P. Japonicum*, and in 1896 Dr. Christ gave it the name of *P. Faurii*. The plant was originally described as the variety *Japonicum* of *P. vulgare*, and the question whether we shall call it *Faurii* or *Japonicum* seems to depend upon whether the varietal name may be ignored. Since everything from seasonal variations to distinct species have heretofore been loosely given the name "variety," and since the line must be drawn somewhere, it would perhaps be well, in raising forms to higher rank, to ignore all names of varieties that were not published as distinct trinomials. Mr. Maxon also seems to be in error in regard to the cause of the coiling fronds as characteristic of this species. He explains it as due to the unequal contraction of the fibrovascular bundles in drying, but a botanist who has collected the plant assures me that the fronds are coiled in the living specimens.

CERATOPTERIS IN FLORIDA.—*Ceratopteris* is a species not common in herbariums, though the State of Florida, at least, seems to contain plenty of it. Mr. Severin Rapp has recently found a new station for it in Central Florida, near Sanford, Orange County. He reports that there are thousands of specimens covering several acres.

ASPLENIUM PINNATIFIDUM IN CONNECTICUT.—The northern range of *Asplenium pinnatifidum* is regarded as barely reaching New York, but Mr. F. W. Kobbe extends it by reporting the find of specimens at Sharon, Conn., during the past summer. They were found by E. I. Huntington.

THE RANGE OF NEPHRODIUM PATENS.—The most recent publication upon the distribution of our ferns says of *Nephrodium patens* that it is found "from Florida to Alabama and California." From this it may be assumed that it has been found in the three States named and by inference, that it grows in the intervening territory. Mr. Harper does not mention it in his notes on the ferns of Georgia, however, nor does Mr. Gilbert. That it grows in the State I have evidence to prove, in the shape of specimens sent me from Thomasville, Ga., by Mrs. A. P. Taylor. In Southern Louisiana I have found it plentiful, and Mr. A. A. Heller collected it in Southwestern Texas. Whether it has been found in Arizona and New Mexico does not seem to be known. The stronghold of this species is in the American tropics and it is to be expected in all the territory bordering the Gulf of Mexico. Its range northward, however, is not well defined and we very much need data upon this point. What is its farthest northern station known at present?

PTERIS SERRULATA IN GEORGIA.—The occurrence of *Pteris serrulata* in the United States has always been considered adventive, but there seem to be good grounds for believing that if it is not a native, it is well naturalized. A new station in Georgia where it is abundant has been discovered by Mrs. E. M. Smith, who has sent me fine specimens from Thomasville. There they grow on the sloping banks of a small stream in the town. This is not the farthest northern locality for the plant in the State, for it has been reported from Macon, but in the latter station it is doubtless an escape.

NEPHRODIUM UNITUM GLABRUM IN FLORIDA.—This species is usually credited to Florida, but no exact locality is given in any list that I have examined. It is therefore worth recording that Mr. Severin Rapp has found it plentiful about Sanford, Orange county, where it grows in standing water in cypress swamps, often reaching a height of four feet. In Maxon's recent list, this plant

is called *Dryopteris unita*, while the 6th edition of Underwood's "Our Native Ferns" makes it a variety of *unita*. Having compared the Florida plant with specimens of true *Nephrodium unitum* from Jamaica, collected by myself in the only exact locality that Jenman names for it, I am convinced that our plant should continue to be regarded as a variety, or at least a form. The texture is less coriaceous and the pinnae slightly broader. This, of course, is not unexpected and appears due to the difference in climate.

ANOTHER STATION FOR *PSILOTUM NUDUM*.—Since I noted a station for *Psilotum nudum* at Sanford, Florida, Mrs. M. A. Noble has sent me specimens from the vicinity of Lake Helen, Florida. This is not so far distant from Sanford, but the finding of more of it suggests the possibility of its being not uncommon in the general region. Further explorations will doubtless discover it in greater abundance.

NOTES FROM THE CATSKILLS.

By J. C. BUCHHEISTER.

Recently I found the largest *Botrychium matricariaefolium* that I know of. It is larger than many specimens of *B. virginianum* or *B. ternatum*, and decidedly ternate. Sometimes I am inclined to think that there are two distinct forms of this fern, the simple pinnate one, and the compound, often ternate one. It is the fleshiest of all the *Botrychiums*, and the simple form is more fleshy than the compound one.

Botrychium matricariaefolium is much inclined to "freaks" and is otherwise variable. Some specimens have two sterile divisions, others two fertile. In some the sterile portion bears sporangia, in others a pinna of the sterile part is transformed into a fertile spike, and forming a secondary fertile frond, arising from the blade. Some plants have a ridiculously small sterile division, while the fertile one is gigantic in proportion and much branched. Another remarkable thing is the different way in which the sterile frond is placed. Sometimes it is immediately below the sporangia bearing panicle, sometimes near to the root,

and sometimes in the middle. Sometimes the sterile division is sessile, and sometimes it has a comparatively long stipe.

The color of *B. matricariaefolium* is decidedly whitish-green, in contrast to *B. lanceolatum*, which is bright green. The first prefers leafmold, and is easily taken up, while the other often grows in rocky ground, and its roots penetrate the soil so deeply, that it is often difficult to take it up with the rhizome. *B. lanceolatum* is uniform, as a rule, never varying to the degree that *B. matricariaefolium* does. I have seldom seen sterile plants of either species. This is in marked contrast to *B. virginianum* and still more to *Ophioglossum*, in which sterile plants are numerous.

There is a remarkable station for *Struthiopteris germanica* here. Remarkable, because it is not in "alluvial soil of rivers," as the books have it, but a rocky hollow in a forest of considerable altitude. A mountain brook runs through it over rocks, as usual in the Catskills, making the ravine rather wet. There the Ostrich fern flourishes to the number of about 20 or 30 healthy plants, but they are all sterile, to my great chagrin. Associated with them are about 10 plants of *Dryopteris Goldiana*. These fruit freely, and are splendid specimens. Most numerous, however, is *Dryopteris thelyteris*, which reaches gigantic proportions, almost as large as the *Struthiopteris*.

When *Osmunda cinnamomea* grows in very wet situations directly in the water, the fronds become harsh to the touch, like *Pteris*, and the pinnules become more or less serrate. This is my observation in Highmount Swamp, which is full of water this year, owing to the wet season we are having.

Griffins Corners, N. Y.

EQUISETUM ROBUSTUM—A. Br. 1844.

Since priority is the order of the day in nomenclature it seems to the writer that the name of this species should be *Equisetum praclatum* Rafinesque. It was recognized and described by him as a new species in the revised "Florula Ludoviciana" of C. C. Robin, in 1817. The original description is as follows: *Caulibus simplicibus crectis scabris fistulosis; vaginis nigrescens crenulatis, corona emulans.* To which is added in

English "A large species akin to *E. Hyemale*, grows on the banks of the Mississippi River in large bushes rising about six feet; the stems are as thick as the finger: the cattle are fond of it in winter and the joiners employed it to polish wood."

There can be no doubt about the species. It is the only *Equisetum* found near New Orleans, where it grows in such quantities on the banks of the Mississippi that the cattle still graze on it in the winter and spring. I am told too that it is still occasionally used by the darkies for polishing wood.—*R. S. Cocks, New Orleans.*

VARIATIONS IN THE HABITAT OF TWO FERNS.

I notice on page 81 of the July BULLETIN, in your "Helps for the Beginner," that you refer to *Nephrodium spinulosum dilatatum* as a *mountain fern*. This is our form common at sea level. It is not an alpine fern with us, nor is it so on the Aleutian Islands nor on the coast about Nome City. I did not see it on the mountains in Southeastern Alaska. Mrs. Parsons also speaks of this as a mountain fern. What seems to be true in the East does not hold good here.

On the Prince of Wales Island I noticed that our common *Lomaria Spicant* was perfectly at home above the snow line, while it is not an alpine fern here. It is rather difficult to account for these peculiarities.—*J. B. Flett, Tacoma, Wash.*

JAMES ANSEL GRAVES.

Elsewhere in this number appears the portrait of James Ansel Graves, a botanist of ability, and one who has played a most important part in building up the Fern Chapter. As treasurer, he has, through the ten years of its existence, devoted much of his time to the writing necessary to increase the membership, which has resulted in making him a wide circle of friends.

Mr. Graves was born at Blenheim, N. Y., Nov. 16, 1828, and his boyhood was spent in this town and the adjoining one of Roxbury, near the head waters of the Delaware. He received a good common school education, and at 18 years of age obtained

a teacher's certificate. He taught his first term in the "Old Red Schoolhouse" since famous as the place where the noted financier Jay Gould and the brilliant John Burroughs received their early education. The latter was among his first pupils. For fourteen years he followed the profession of school teaching, and then took up the business of marble cutting, in which he is still engaged.

From boyhood Mr. Graves has had a leaning toward the sciences, especially mathematics, astronomy and botany, but it was not until comparatively late in life that botany took first place in his studies. His collection of living plants and herbarium specimens now represent upward of a thousand species. His specialties are the sedges and grasses.

Mr. Graves has contributed numerous articles to botanical publications, and also furnished much of the data for the "Flora of the Upper Susquehanna." In recent years he has taken a greater interest in living plants, and his grounds contain specimens of nearly all the wild plants of interest in his locality, as well as many others from distant places.

Since 1885 he has resided at Susquehanna, Pa., where he has for some years been a member of the Borough Council and of the Board of Health.

THE CULTIVATION OF OUR HARDY FERNS.

BY WILLARD N. CLUTE.

When one becomes interested in ferns, he seldom goes long without beginning a collection of the living plants. Herbarium specimens will answer for systematic study, but one cannot learn anything of the plant's habits from such sources. He must go to the woods and fields for these studies or else bring wood and field home with him by transplanting the ferns to his own grounds. Probably the great majority of ferns planted in private grounds are planted for their beauty alone; but this does not militate against the fact that such specimens afford the most convenient opportunity for study.

Taken as a whole, I know of no race of plants that lend themselves so readily to cultivation (in the sense of being grown

about our dwellings) as the ferns. With the minimum of care in transplanting, times and seasons are alike to them. The best time for the work is of course in early spring or late autumn for then the plants are dormant and appear scarcely to notice their removal; but if one does not come upon the specimens he wants until mid-summer, he may still take them, in this case cutting off the fronds and taking care that the rootlets do not get dry, by wrapping them in wet cloths or sphagnum moss. He may even retain the fronds, provided he secures most of the roots and is not too dilatory in getting his specimens into their new location; but if it will be a day or so before they can be planted, he had better remove the fronds. In the matter of growth the ferns are divided into two divisions. One of these produces fronds all summer and the other sends up fronds only in spring. The first, usually characterized by slender creeping rootstocks, will soon have a new crop of fronds to replace those cut off. The others have shorter, thicker rootstocks and less readily respond to calls for more fronds, but may be depended upon to ultimately produce them.

The chief requisite of ferns is shade. This most species must have or they will become yellow, dwarfed and of no pride to their owner. Moisture, too, they delight in, but only the water loving species, like the cinnamon, chain and sensitive ferns, will thrive in poorly drained locations. The soil should be light and porous and as near like that in their chosen haunts as possible; but as such soil conditions are not usually to be found in town and city gardens, a good way to plant the ferns is to excavate a hole considerably larger than the roots of the fern to be planted and fill this hole with soil from the woods. The fern will grow in it as other plants grow in a flower pot. I have owned a thrifty fern garden planted in this way, the original soil being a sterile clay and gravel from the bottom of a cellar.

Whether or not one shall have a fern garden, in which all the ferns are arranged, or whether the species shall be planted here and there about the grounds, depends upon individual taste. I am inclined to think that the latter is preferable. As striking and handsome as most species are, there are many that, attractive in themselves, lose by being brought too closely into competition

with others. If the plants are disturbed about the grounds, those that will endure partial sunshine, as the *Osmundas* and the ostrich fern (*Struthiopteris Germanica*) may be used with very decorative effect in various ways. The ostrich fern, especially, being often six feet high, is coming into great favor for planting about verandas and the front of buildings, and is now part of the landscape gardener's stock in trade. If this fern is planted in good well drained soil and given plenty of moisture, it will soon form a clump by means of its creeping stolons, that no other fern can surpass. Other ferns show off well planted about the base of trees, or in the shaded parts of sections devoted to wild flowers. If the ferns are assembled in the fern garden care should be taken to plant the large species in the back ground and in such a way that they cannot crowd lesser species.

The foregoing, of course, applies only to earth loving species. The rock ferns must have suitable quarters, though many, including the rare little walking fern, will grow in well drained leaf-mould. A rockery is easily built of any stones that may be handy and may range in kind from a mere mound of stones and earth to a well constructed wall with plenty of earth-filled chinks in which to plant the ferns. The latter is best made in front of another wall and the space between the two also filled with earth. It is the prevailing belief that certain ferns will not live unless grown on limestone. This is incorrect, though a few species may possibly grow more thriftily when upon such rock.

It is a curious fact that one of the ferns most difficult to transplant is the common bracken, a fern that is abundant in the wild state nearly everywhere. This is because the rootstock is long and provided with few roots and also buried deeply in the earth. My method is to select small plants with as much rootstock as possible, and wait for them to develop, which does not take long. I have sometimes planted them on top of the soil by forming a small mound of earth around them, adding to it as the rootstock begins to spread.

When one has established in his ground all the ferns of his own locality and begins to sigh for more species, he should remember, if he lives in the East, that Western America has many species that are perfectly hardy. Most of these are species related to his own forms and much of interest can be found in

watching and comparing their growth. Indeed, he may follow his latitude entirely around the earth and be sure that the ferns of the regions it crosses will thrive with him. Thus Northern Europe, Siberia and Japan may contribute to his collection. Even New Zealand and South Africa will afford numerous additions. Many of these can be obtained by exchange; others may be secured from dealers.

When the ferns are once established all they require is to be left to themselves. They resent any digging about their roots and show it in many ways. A few of them, such as the maiden hair, may be cut sparingly for use, as new fronds are produced throughout the season; but the majority will thrive best if simply kept free from weeds and frequently watered.

NOTES ON THE FERNS OF THE FLORIDA EAST COAST

By MRS. E. C. ANTHONY.

The following notes are based on observations made from Jacksonville to Key West, during the winter of 1900-1901. The fern found most abundantly is *Nephrodium patens*. A peculiarity of it which is not noticed in the Manuals, is the suddenly reduced upper part of the frond to a long caudate tip, from three to five inches long, which makes the plant readily identified. *Osmunda regalis* is somewhat common as far south as Ormond but not abundant below that place. *O. cinnamomea* is very common also but no *O. claytoniana* is seen. *Onoclea sensibilis* is abundant from north to south.

Florida is no exception to the rest of the world in having an abundance of *Pteris aquilina*. It differs little from some forms of our northern plant, except that where ours are scurfy, the southern form is smooth and coriaceous in texture. In the vicinity of Miami the variety *pseudocaudata* is clearly marked. *P. longifolia* with *P. aquilina* were the only ferns found in the dry coral limestone of Key West. But one plant of *Blechnum serrulatum* was found and that was sterile. It was beside the road at Ormond, and as further search both then and later in the season failed to bring to sight any other specimens, one must conclude that it is rather rare in that part of Florida.

Two very interesting ferns are found growing in the Palmetto trees (*Screnoa serrulata*). One is *Polypodium aureum*, a broad, handsomely cut fern, which waves its banners in the air far above our reach, but fortunately we find a fallen tree and secure the trophies. Another is the grass fern (*Vittaria lineata*), well named, for if one is not on the lookout for it, it would be readily passed by as a bunch of grass. The rich hammock jungles about Miami are prolific of ferns of various sorts. Growing with the more common sorts we find *Polypodium phyllitidis* with its long narrow fronds filled with large fruit dots, growing on decaying logs, *Nephrolepis exaltata*, apparently identical with our sword-fern, and a luxuriant growth of the caudate variety of *Pteris aquilina*, from perfect plants not more than seven inches high, to many reaching three feet in height. The formation of this part of the country is of limestone, and here, near Miami, it crops out in rugged walls filled with holes, large and small. In these holes, apparently destitute of either earth or moisture, little ferns have established themselves, so that the whole wall is embroidered with their delicate fronds. *Pteris longifolia* and *Aneimia adiantifolia* are the ferns most frequently found, but are rather starved specimens, some being not more than two inches high. In the richer ground at the base of the wall under sheltering shrubs the *Pteris* grows from twelve to fifteen inches high, and on an adjoining hillside under the pines and silver palms the *Aneimia* grows luxuriantly. This latter is an exceedingly pretty fern, of which the two lower branches of the frond elongate and bear the sporangia on the pinnately divided branchlets. The sterile portion is deep green, shining and coriaceous.

Polypodium incanum, Swartz, is everywhere, fringing the branches of the oaks, or covering the decayed stumps, and in damp places on the ground. A trip up the Miami river to the Everglades gave us several new treasures. We there first found *Woodwardia virginica* in profusion on the banks at the foot of the rapids. It is very abundant throughout the East coast in marshes and almost rivals in this respect *Nephrodium patens*. The fertile fronds of *N. patens* at that time of year (February) were only found in drier ground.

Nephrolepis exaltata was very abundant down the river, but growing on the ground rather than on trees. On the South Fork of the Miami were most luxuriant growths of *N. acuta*. It was difficult to procure suitable specimens for the herbarium, so long were the fronds, many measuring more than five feet in length. They grew as thickly as it was possible for them to stand, under the shade of low trees on the river bank. This fern has every resemblance to that sold by the florists as the Boston sword-fern. On this trip, also, were procured fine specimens of *Acrostichum aureum*. *A. lomarioides* was abundant farther north, particularly at Ormond where it lined the banks of the Halifax river in great numbers. The largest specimen was found at a point below Palm Beach, at the ostrich farm, where one fruiting frond measured nine feet in length. A few starved plants were found on the Tomoka river, a fresh water stream flowing into the Halifax, showing that the plant needs the influence of the salt water. The two species seemed to intermingle, or possibly not enough study has been given to them. A good deal of time was spent over them at Ormond, and they were found very puzzling. The plants found on the Miami river answered very perfectly to the description in Dr. Underwood's "Our Native Ferns," in the solitary clusters, comparatively few pinnae, and sporangia confined to the upper part of the frond; in fact, in regard to everything but the black spurs which were not very evident. On a small creek flowing into the Miami river, on splendid specimens of *A. aureum* were what might be undeveloped or abortive spurs.

When we came to study them in Ormond, we found in the same clump or closely adjoining, both kinds of stems, pinnae, and fructification. The swampy shores of Silver Spring Run, and the Ocklawaha, into which it empties, would seem to be an ideal place for fern allies, but these were almost destitute of anything of the kind. A few plants of *Nephrodium patens*, one or two bunches of *Vittaria*, and a few of *Polypodium aureum*, were all that were seen in two trips of a dozen miles. In the vicinity of St. Augustine and Jacksonville, in the wet pine barren were great numbers of *O. cinnamomea*, and *Onoclea sensibilis*, and the marshes were full of *Woodwardia virginica*, and *W. angustifolia*, but all sterile.

Gouverneur, N. Y.

RECENTLY DISCOVERED SPECIES AND FORMS.

The following list contains all the species, varieties and forms of ferns described from America in American publications during the past ten years, so far as known. In this list are not included previously known forms or varieties which have recently been raised to specific rank.

Adiantum modestum Underwood. Bull. Torr. Bot. Club. 28: 46, 1901.

Asplenium Clutei Gilbert. Fern Bull. 8: 62, 1900.

Asplenium ebeneum Hortonae Davenport. Rhodora. 3: 1, 1901.

Asplenium Kamchatkanum Gilbert. Fern Bull. 9: 54, 1901.

Asplenium vespertinum Maxon. Bull. Torr. Bot. Club. 27: 197, 1900.

Aspidium simulatum Davenport. Bot. Gaz. 19: 497, 1894.

Athyrium cyclosorum f. *Hillii* Gilbert. N. Am. Pteridophytes. 32, 1901.

Athyrium cyclosorum f. *strictum* Gilbert. N. Am. Pteridophytes, 32, 1901.

Athyrium filix-foemina f. *elegans* Gilbert. N. Am. Pteridophytes. 33, 1901.

Athyrium filix-foemina f. *plano-rhoeticum* Gilbert. N. Am. Pteridophytes. 34, 1901.

Athyrium filix-foemina f. *rectangulare* Gilbert. N. Am. Pteridophytes. 35, 1901.

Athyrium filix-foemina f. *rubellum* Gilbert. N. Am. Pteridophytes. 35, 1901.

Botrychium Coulteri Underwood. Bull. Torr. Bot. Club. 25: 537, 1898.

Botrychium Jenmani Underwood. Fern Bull. 8: 59, 1900.

Botrychium occidentale Underwood. Bull. Torr. Bot. Club. 25: 538, 1898.

Botrychium pumicola Coville. Our Native Ferns, 6th Ed. 69, 1900.

Botrychium tenebrosum A. A. Eaton. Fern Bull. 7: 8, 1899.

Botrychium ternatum Oneidense Gilbert. Fern Bull. 9: 27, 1901.

Cheilanthes amoena A. A. Eaton. Fern Bull. 5: 44, 1897.

Cystopteris fragilis f. *magnasora* Clute. Fern Bull. 9: 64, 1901.

Dennstaedtia punctilobula f. *cristata* Maxon. Fern Bull. 7: 63, 1899.

Dicksonia pilosiuscula f. *schizophylla* Clute. Fern Bull. 10, 87, 1902.

Dryopteris aquilonaris Maxon. Bull. Torr. Bot. Club. 27: 638, 1900.

Dryopteris Gilberti Clute. Fern Bull. 8: 67, 1900.

- Dryopteris Goldieana* f. *celsa* Palmer. Proc. Biol. Soc. Wash. 13: 65, 1899.
- Equisetum arvense* f. *diffusum* A. A. Eaton. N. Am. Pteridophytes. 25: 1901.
- Equisetum fluviatile* f. *intermedium* A. A. Eaton. Fern Bull. 10: 73, 1902.
- Equisetum litorale* f. *arvensiforme* A. A. Eaton. Fern Bull. 10: 44, 1902.
- Equisetum litorale* f. *formosum* A. A. Eaton. Fern Bull. 10: 45, 1902.
- Equisetum sylvaticum* f. *squarrosum* A. A. Eaton. Fern Bull. 9: 36, 1901.
- Equisetum telmateia* f. *Hillii* A. A. Eaton. Fern Bull. 8: 77, 1900.
- Equisetum variegatum* f. *Jesupi* A. A. Eaton. N. Am. Pteridophytes. 27, 1801.
- Isoetes Dodgei* A. A. Eaton. Fern Bull. 6: 6, 1898.
- Isoetes Eatoni* Dodge. Ferns and Allies of N. Eng. 39, 1896.
- Isoetes echinospora truncata* A. A. Eaton. N. Am. Pteridophytes. 27, 1901.
- Isoetes Engelmanni* f. *Caroliniana* A. A. Eaton. Fern Bull. 8: 60, 1900.
- Isoetes foveolata* A. A. Eaton. Ferns and Allies of N. Eng. 38, 1896.
- Isoetes Gravesii* A. A. Eaton. Fern. Papers. 14, 1900.
- Isoetes Harveyi* A. A. Eaton. Fern. Papers. 11, 1900.
- Isoetes heterospora* A. A. Eaton. Fern. Papers. 8, 1900.
- Isoetes hieroglyphica* A. A. Eaton. Fern. Papers. 10, 1900.
- Isoetes Macouni* A. A. Eaton. Fern Bull. 8: 12, 1900.
- Isoetes melanopoda Californica* A. A. Eaton. N. Am. Pteridophytes. 27, 1901.
- Isoetes minima* A. A. Eaton. Fern Bull. 6: 30, 1898.
- Isoetes Montezumae* A. A. Eaton. Fern Bull. 5: 25, 1897.
- Isoetes Orcuttii* A. A. Eaton. Fern Bull. 8: 13, 1900.
- Isoetes saccharata* f. *reticulata* A. A. Eaton. Proc. Biol. Soc. Wash. 14: 49, 1901.
- Isoetes saccharata* f. *Palmeri* A. A. Eaton. Proc. Biol. Soc. Wash. 14: 49, 1901.
- Lycopodium adpressum* f. *polyclavatum* McDonald. Fern Bull. 9: 8, 1901.
- Lycopodium complanatum flabelliforme* Fernald. Rhodora. 3: 280, 1901.
- Lycopodium porphyllum* Lloyd and Underwood. Bull. Torr. Bot. Club. 27: 150, 1900.
- Lygodium volubile angustum* Clute. Fern Bull. 8: 90, 1900.

- Nephrodium Boottii* f. *multiflorum* Gilbert. N. Am. Pteridophytes. 36, 1901.
- Nephrodium spinulosum* f. *fructuosum* Gilbert N. Am. Pteridophytes. 37, 1901.
- Nephrodium thelypteris* f. *Pufferae* A. A. Eaton. Fern Bull. 10: 78, 1902.
- Ophioglossum Alaskanum* E. G. Britton. Bull. Torr. Bot. Club. 24: 556, 1897.
- Ophioglossum arenarium* E. G. Britton. Bull. Torr. Bot. Club. 24: 555, 1897.
- Osmunda cinnamomea* f. *glandulosa* Waters. Fern Bull. 10: 21, 1902.
- Pellaea atropurpurea cristata* Trelease. Rept. Mo. Botanical Gardens. 12: 77, 1901.
- Pellaea atropurpurea occidentalis* E. Nelson. Fern Bull. 7: 30, 1899.
- Polypodium hesperinum* Maxon. Proc. Biol. Soc. Wash. 13: 200, 1900.
- Polypodium Macbridense* Shimek. Bull. Lab. Nat. Hist. Univ. Iowa. 4: 199, 1897.
- Polypodium vulgare* f. *acuminatum* Gilbert. Fern Bull. 10: 13, 1902.
- Polypodium vulgare Columbianum* Gilbert. N. Am. Pteridophytes. 38, 1901.
- Polystichum acrostichoides* f. *crispum* Clute. Our Ferns in Their Haunts. 107, 1901.
- Polystichum munitum* f. *flabellatum* A. A. Eaton. Fern Bull. 9: 8, 1901.
- Polystichum tenue* Gilbert. Fern Bull. 8: 63, 1900.
- Pteris aquilina pseudocaudata* Clute. Fern Bull. 8: 39, 1900.
- Selaginella arenicola* Underwood. Bull. Torr. Bot. Club. 25: 541, 1898.
- Selaginella Bigelovii* Underwood. Bull. Torr. Bot. Club. 25: 130, 1898.
- Selaginella cinerascens* A. A. Eaton. Fern Bull. 7: 33, 1899.
- Selaginella densa* Rydberg. Mem. N. Y. Bot. Gard. 1: 7, 1900.
- Selaginella rupestris Fendleri* Underwood. Bull. Torr. Bot. Club. 25: 127, 1898.
- Selaginella rupicola* Underwood. Bull. Torr. Bot. Club. 25: 129, 1898.
- Selaginella Watsoni* Underwood. Bull. Torr. Bot. Club. 25: 127, 1898.
- Woodwardia spinulosa* f. *ramosa* A. A. Eaton. Fern Bull. 9: 87, 1901.

NOTES.

The new form of *Dicksonia schizophylla*, named by Mr. Clute in the July BULLETIN, still retains its peculiar form, and, like the first ones, all the fronds found are sterile. The original plant is gradually spreading by means of its rootstock, one new plant being found.—A. Vincent Osmun, State College, Amherst, Mass.

Miss Jean Broadhurst writes that while in Chamonix, France, last summer she found six species of ferns on an old stone wall growing in a space less than 40 inches square. Five of these, namely: *Phegopteris phegopteris*, *P. dryopteris*, *Asplenium filix-foemina*, *A. trichomanes* and *cystopteris fragilis* are also native to the United States, and the sixth, *Nephrodium filix-mas* is found in Canada.

The ferns in my wild garden were badly eaten last summer and it was not till late in the fall that I discovered the depredator. To my surprise I found an interesting case of protective mimicry in the little green worm which so resembled a small section of the fruiting pinnae of *Asplenium angustifolium*. The yellow stripes on the sides of the body had the same relative distance and slant of the fern sori, were perhaps a trifle yellower, but the resemblance was very marked. The worm was a little more than an inch long. I shall watch for the moth with interest next year, if the depredations continue.—Mrs. E. C. Anthony, Gouverneur, N. Y.

—A correspondent who has tried to raise the Boston fern (*Nephrolepis exaltata*) from spores, without success, asks if others have been more successful. She also asks to have answered through the BULLETIN the following: (1.) Is the Boston fern a hybrid? (2.) Will the scattering of different fern spores on the propagating bed produce hybrids? *Ans.*—*Nephrolepis exaltata* is not a hybrid. If spores are scattered thick enough and all give rise to prothallia it is possible that hybrids might result. The chances, however, are greatly against it. The surest way of producing hybrids is by sectioning prothallia and planting the portion of one containing the archegonia close to another containing only antheridia.

EDITORIAL.

In this issue the first of the proposed series of Fern Floras of the States appears. A significant fact brought out by the present flora is the remarkable paucity of fern species in the State of Louisiana. There is a much larger number in the single county in which the FERN BULLETIN is published, notwithstanding that Louisiana is a thousand miles nearer the tropics where fern species abound. It is expected that the other floras will develop many more important facts. It is yet too early to indicate the order in which the floras will be published, but an effort will be made to publish first those of special interest, such as that of Florida, Texas, California, Washington and New York, though it will depend somewhat upon the order in which they are completed. In order to secure uniformity, each flora will conform to the nomenclature of the present one and the best known common name will be given when the plant has any. When a species reaches its limit within a State this limit will be given, if possible, and the localities for rare species will be noted. There will also be observations on the abundance, distribution and habitats of the other species, references to the literature of the subject and a short account of the topography of the State. Each flora will be written by the student most familiar with the subject. In the April issue we shall be able to give a more extended list of the floras with their authors.

* *
*

We have just received from Mr. B. D. Gilbert the manuscript index to the first ten volumes of the FERN BULLETIN, which he has been preparing for the Fern Chapter and which we will shortly publish. The index is in reality five separate indexes, namely, a general index of titles, an index of species, an index of authors, an index of publications noticed, and an index of illustrations, and represents a vast amount of labor. In the general index there are nearly five hundred titles. Although Mr. Gilbert has refrained from listing any species unless something of importance is said concerning it, the index of species shows that no less than four hundred and thirty-two species have

been so mentioned, many of them referred to twenty times or more. This index will probably be too bulky to bind with a volume of the BULLETIN, and will, therefore, be issued in a neat paper cover. It will doubtless be sent free to members of the Fern Chapter, and to others the price will be 25 cents. Those who wish may order copies at once and be sure of receiving them as soon as issued. It is the most complete index to the literature of ferns ever published for a similar period.

* * *

As the series of articles upon the genus *Equisetum* that has been running for several years in this journal draws to a close, we begin to appreciate the debt all fern students owe to Mr. Eaton for so clearly and carefully distinguishing our forms and species of this genus. Mr. Eaton is now at the Ames Botanical Laboratory, North Easton, Mass., where he is preparing a monograph on the Isoetaceae of North America, which we may expect to be done in an equally careful manner. He is desirous of examining all available material in *Isoetes* and will either return specimens submitted to him or send others in exchange, as the sender may direct. All students know the value of having their specimens named by an authority, and it is hoped that no one will neglect this opportunity to help Mr. Eaton while verifying their own identifications.

* * *

So many people, in renewing their subscriptions to this journal, have asked for a sample of the *American Botanist* that we have ordered enough extra numbers of the January issue printed to enable us to send a copy to every reader of the FERN BULLETIN who is not also a subscriber to the *Botanist*. The editor asks that they be accepted with his compliments, and trusts that they may prove of interest.

* * *

This issue has been unavoidably delayed. Contributors will please send manuscripts early in order that we may be on time with the April number.

LEAVITT, R. G. *The Root-hairs, Cap and Sheath of Azolla*, illust. Botanical Gazette. D. 1902.

MAXON, W. R. *A Japanese Polypody*, illust. Popular Science News. O. 1902.

MIYAKE, K. *Notes on Japanese Ferns*. Fern Bulletin. O. 1902.

SHAW, E. L. *A New Station for Polypodium vulgare var. Cambricum*. Rhodora. O. 1902.

SMITH, G. E. *New Zealand Ferns and Fern Study*. Fern Bulletin. O. 1902.

UNDERWOOD, L. M. *American Ferns.—IV. The Genus Gymnogramme of the Synopsis Filicum*. Torrey Bulletin. N. 1902.

UNDERWOOD, L. M. *Some Features of Future Fern Study*. Fern Bulletin. O. 1902.

UNDERWOOD, L. M., AND MAXON, W. R. *Notes on a Collection of Cuban Pteridophyta, with Descriptions of four New Species*, illust. Torrey Bulletin. O. 1902.

YATES, L. G. *Ferns of the Pacific Coasts*. Popular Science News. N. 1902.

THE LINNEAN FERN CHAPTER OF THE AGASSIZ ASSOCIATION.

—At the election of the Chapter in October, the following officers were chosen for the year 1903: President, B. D. Gilbert, Clayville, N. Y.; Vice-President, George E. Davenport, Medford, Mass.; Secretary, Homer D. House, N. Y. Botanical Garden, Bronx Park, New York; Treasurer, James A. Graves, Susquehanna, Pa. The report of the Judge of Elections will appear in full in the Annual Report of Officers for 1902.

—The Tenth Annual Report of the Chapter will be issued at an early date. The list of members will contain the names of all those who join previous to the publication of the report. It is desirable, however, to have the names in as soon as possible. Any of the older members who may have made a change of residence during the last year should send notice of same, together with present address, to the Secretary without delay.

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1903

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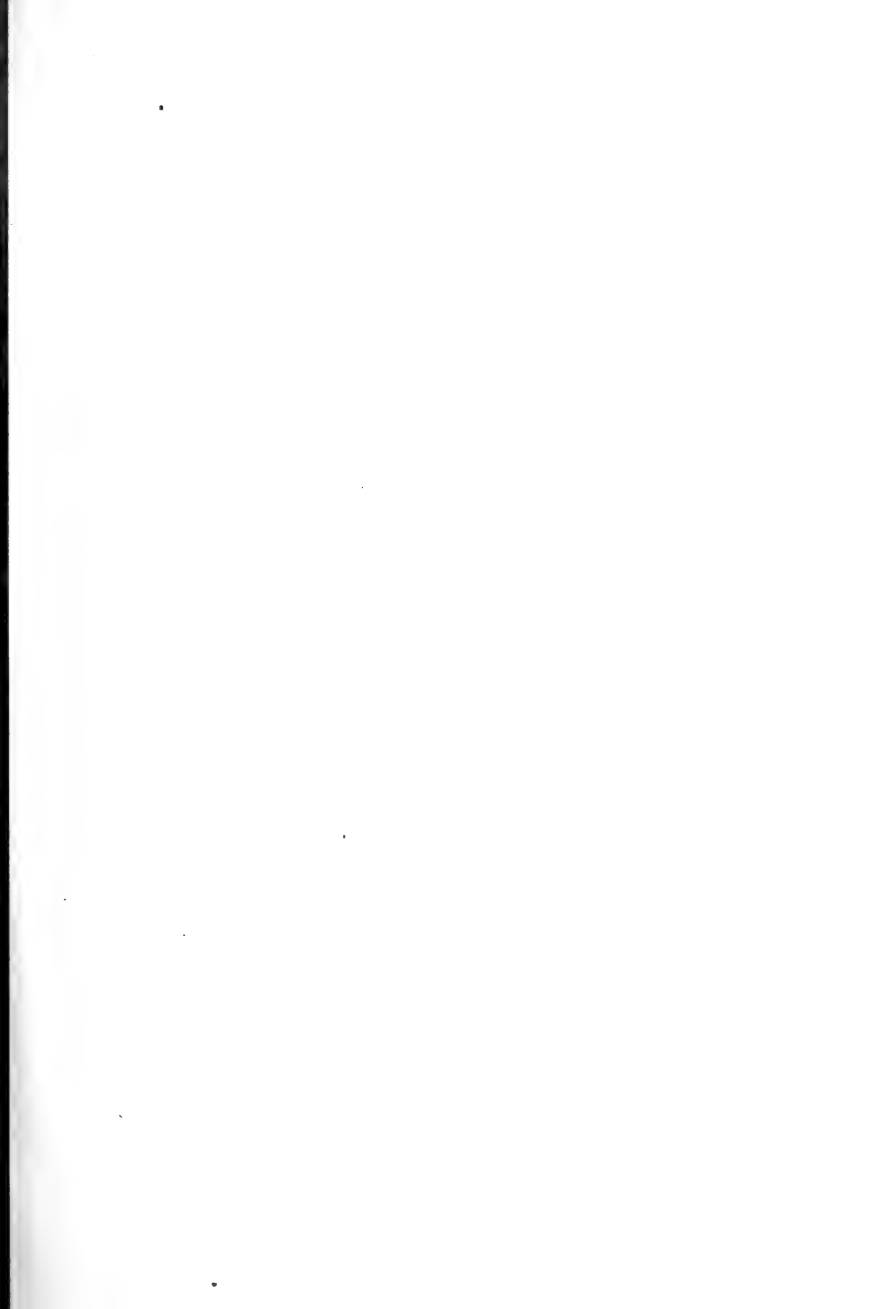
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ROBERT ROBINSON SCOTT

THE FERN BULLETIN

VOL. XI.

APRIL, 1903.

No. 2

THE FERN FLORA OF TEXAS.

By JULIAN REVERCHON.

The State of Texas covers so vast an area that it has never been completely explored by botanists and, as a consequence, the fern flora is known only in a general way. It is clear, however, that the number of species is fairly large, which is due in great measure to the fact that in this State the western and eastern floras meet, and we have the ferns belonging to both floras. The zone containing the eastern flora comprises less than one-fourth of the State and lies east of the 97th meridian in a stretch of country approximately a hundred miles wide. It was once covered with a dense forest with numerous swamps, and may be termed the moist zone in contrast to the rest of the State. The ferns that grow here are typical eastern species, such as *Os-munda regalis* and *O. cinnamomea*, *Woodwardia angustifolia*, *Onoclea sensibilis*, *Asplenium ebeneum* and *Athyrium filix-foc-mina*.

Westward of this zone the country becomes more arid and topographically may be divided into four regions, each possessing species peculiar to itself, as follows: (1) *The Northwest district*, north of the Concho river, mostly an immense prairie with here and there rocky bluffs of low elevation. Here, owing to the nature of the country, ferns are few, the most characteristic species being *Pellaea atropurpurea*, *Cheilanthes lanuginosa*, *C. tomentosa*, *Notholaena dealbata*, and *N. sinuata*. (2) *The Granite district* in Burnet, Llano and Mason counties, characterized by bold outcrops of rock that often rise into picturesque peaks. The principal ferns found here are *Cheilanthes Eatoni*, *C. Lindheimeri*, *Notholaena Hookeri* and *Pellaea Wrightiana*. (3) *The Southwest district*, including roughly all the country south of the Concho, east of the Pecos and extending toward the mouth

BOOK NEWS.

It is well known that the genus *Gymnogramme*, as usually considered, contains ferns of widely different aspect and character. More than one author has suggested a division, and the latest, Prof. L. M. Underwood, has now separated the twenty-six American species into no less than eight genera. Even conservative botanists are willing to admit that the group needs some revision, though whether the lines can be stretched so far, each student must decide for himself. The reviewer would have welcomed a little more explanation of the reasons for the adoption of each genus. Prof. Underwood should remember that there are many fern students in the world who will not accept anyone's dictum unless good and sufficient reasons for doing so are given. This revision also points a moral for those who are fond of the "new nomenclature" in the treatment of the fern we have long called *Gymnogramme triangularis*. In 1900 Prof. Underwood decided this was *Gymnopteris tridngularis*, and now, two years later, he again changes it to *Ceropteris triangularis*. Dilettante botanists will perhaps find amusement in following up these lightning changes, but we who must use terms that convey some meaning will have to stick to the name of *Gymnogramme* until the species becomes permanently settled in the directory.

One thing lost to science through the ignorance of species makers, is the purity of its nomenclature. Frederic E. Clements, who has been investigating the matter, finds a very mixed lot of names, and in the December number of *University Studies*, published at Lincoln, Nebr., he lays down a few rules by the use of which botanical nomenclature may be vastly improved. The rule that pleases the reviewer most is the one to do away with the practice of "honoring" plant students and collectors by naming genera after them. This practice has become very common in recent years and led to such monstrosities in names as *John-smithotoma*, *Igsmithia*, *Balfourodendrum*, *Greeneina* and *Hodgsoniola*. The author gives a list of more than two hundred such abominations. He would also abolish all anograms, of which there are twenty-five or more known. Every botanist who would

like to see this nomenclature question settled, to stay settled, will find this paper most interesting reading. The subject is thoroughly discussed in all its aspects, and the author's suggestions should be adopted.

It seldom happens that the lover of out-doors is interested in only one branch of natural history. The plant collector usually has time for a glance at the birds and the bird student is not insensible to the charms of the flowers. Both are naturally interested in the insects that cross their paths, and to such as have not yet become familiar with their habits we would recommend Hunter's "Elementary Studies in Insect Life."* This is not a guide to the various species, but rather an explanation of the biological problems presented by this section of creation. Our attention is engaged by such subjects as the life cycle, special senses, protective devices, social life, instinct, relations of plants and insects, wealth of insect life, etc. There are 258 illustrations, a large number of them being photographs.

INDEX TO CURRENT LITERATURE RELATING TO FERNS.

Readers are requested to call our attention to any omissions from this list.

BIRD, H. A. *The Walking Fern*. Gamophyllus. Au.-S. 1902.

CLUTE, W. N. *A Ten Years' Retrospect*. Fern Bulletin, O. 1902.

DAVENPORT, G. E. *Early Fern Study in America*. Fern Bulletin, O. 1902.

DRUERY, C. T. *British Fern Culture*. Fern Bulletin, O. 1902.

EATON, A. A. *A New Equisetum*. Fern Bulletin, O. 1902.

FLOYD, F. G. *A Cristate Form of Nephrodium Marginale*. Rhodora. D. 1902.

GILBERT, B. D. *Historical Sketch of the Linnacan Fern Chapter*. Fern Bulletin, O. 1902.

JEWELL, H. W. *Notes on Some Ferns of Franklin County, Maine*. Rhodora. D. 1902.

* Elementary Studies in Insect Life, by Samuel J. Hunter, Topeka, Kan. Crane & Co., 1902. 12 mo. 340 pp. \$1.25.

LEAVITT, R. G. *The Root-hairs, Cap and Sheath of Azolla*, illust. Botanical Gazette. D. 1902.

MAXON, W. R. *A Japanese Polypody*, illust. Popular Science News. O. 1902.

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of the Rio Grande. The northwest portion is very broken and exploration has revealed *Cheilanthes leucopoda*, *C. candida*, *Pellaea flexuosa*, *P. aspera*, and *Aneimia Mexicana*. (4) *The Trans-Pecos district*, west of the Pecos. Here we find the highest and, in fact, the only true mountains in the State. Many species of the Southwest district also occur in this and *vice versa*. Among the ferns peculiar to the region may be mentioned *Adiantum tricholepis*, *Pellaea ternifolia*, *P. intermedia*, *Notholaena ferruginea*, *N. Grayi*, *Gymnogramme Ehrenbergiana* and several others that are also found in New Mexico and Mexico. This district has only been partially explored, and what is known as the great bend of the Rio del Norte is as yet a *terra incognita* to botanists.

In Eaton's "Ferns of North America," thirty ferns are accredited to Texas, and in Gilbert's "Pteridophytes of North America" eight more are added. Our present knowledge of the fern flora allows us to list the following fifty-one ferns and fifteen allies from the State. Additions, corrections and extensions of range will be gladly received by the author.

OPHIOGLOSSACEÆ.

Ophioglossum valgatum L. ADDER'S-TONGUE. The true species has been found only in the bottom lands of the Sabine river, near the Big Sandy. The form *Engelmanni* is common in north and central Texas.

Ophioglossum crotalophorides Walt. Houston—Hall.

Ophioglossum pusillum Nutt. Several stations in Newton county, J. M. Fetherolf. Not before reported from Texas.

Botrychium Virginianum Sw. RATTLESNAKE FERN. Very rare. In woods Dallas and eastward.

OSMUNDACEÆ.

Osmunda regalis L. FLOWERING FERN. Common in swamps in the eastern part.

Osmunda cinnamomea L. CINNAMON FERN. Common in damp places, eastward.

POLYPODIACEÆ.

Polypodium incanum Sw. GRAY POLYPODY. On trees. Rare at Dallas, more common east and south.

Adiantum Capillus-Veneris L. VENUS-HAIR FERN. Damp rocks at Dallas, also west and southwest.

Adiantum tricholepis Fee. Collected by Bigelow at the mouth of the Pecos river.

Aspidium juglandifolium Kze. Huse's tanks and Van Horn well.—*Mexican Boundary Survey*.

Aspidium trifoliatum Kze. Collected by Lindheimer at the entrance to a cave, in 1878.

Asplenium ebeneum Ait. EBONY SPLEENWORT. Damp woods east and south. Dallas, rare.

Asplenium parvulum Mart. and Gal. LITTLE EBONY SPLEENWORT. Sheltered rocks, south and west. Houston, *Hall*; Chenate Mts., *Neally*.

Asplenium trichomanes L. Reported from Texas in Davenport's list. A cosmopolitan fern, likely to occur on shaded rocks.

Athyrium filix-foemina Roth. LADY FERN. Damp woods, east.

Cheilanthes Alabamensis Kze. Shady rocks, southwest.

Cheilanthes Eatoni Bak. Granitic rocks, Mason county.

Cheilanthes Fendleri Hook. Collected in Texas by Fendler, not since collected.

Cheilanthes lanuginosa Nutt. On exposed rocks, not rare in the southwest.

Cheilanthes Lindheimeri Hook. Granitic rocks, Burnet and Mason counties.

Cheilanthes leucopoda Link. Uvalde canyon, collected by Mrs. Young.

Cheilanthes microphylla Sw. Uvalde canyon, *Mrs. Young*; Limpia canyon, *Neally*.

Cheilanthes myriophylla Desv. Credited to Texas in Eaton's "Ferns of North America."

Cheilanthes tomentosa Link. Crevices of rock. The most common western fern.

Cheilanthes Wrightii Hook. Limpia canyon, *Neally*.

Gymnogramme Ehrenbergiana Klotz. Chenates Mts., V. Havard.

Nephrodium Floridanum Hook. Newton county, J. M. Fethcrolf. Not before reported from Texas.

Nephrodium patens Sw. Along streams east, south and southwest.

Nephrodium thelypteris L. MARSH FERN. In bogs at Hempstead, E. Hall.

Notholaena Aschenborniana Klotz. Collected by Tweedy and Drummond, but apparently not since seen.

Notholaena candida Hook. On rocks in the southwest. Sabinal canyon, Gillespie county, *Germys*.

Notholaena dealbata Kze. Exposed rocks in the western part.

Notholaena ferruginea Hook. Found in the extreme west. Limpia canyon, *Neally*; Chenates Mts., *Havard*.

Notholaena Grayi Dav. Limpia canyon, *Neally*; Chenates Mts., *Havard*.

Notholaena Hookeri D. C. Eat. On rocks in the western part. Chenates Mts., *Havard*; Limpia canyon, *Neally*; House Mt. (Llano). The latter is probably its most eastern station.

Notholaena Schaffneri Underw. Presidio county, *Neally*.

Notholaena sinuata Kaulf. On rocks in the southwest.

Onoclea sensibilis L. SENSITIVE FERN. Swamps in the eastern part.

Pellaea aspera Bak. On exposed rocks in the southwest. Head of Hondo river and San Geromino creek, *Reverchon*; Uvalde canyon, *Mrs. Young*; Chenates Mts., *Neally*.

Pellaea flexuosa Link. On shaded rocks. Not rare south and west of Llano.

Pellaea intermedia Nutt. Limpia canyon, *Neally*.

Pellaea pulchella Fee. Chenates Mts., *Havard*; near El Paso, G. R. Vasey; Uvalde canyon, *Mrs. Young*.

Pellaea ternifolia Link. Limpia canyon, *Neally*.

Pellaea Wrightiana Hook. Granitic rocks in Llano county.

Pellaea atropurpurea Link. PURPLE-STEMMED CLIFF-BRAKE. On sandy or rocky banks. Dallas, rare; common further west.

Polystichum acrostichoides Schott. CHRISTMAS FERN. Common in damp woods in the eastern part.

Pteris aquilina pseudocaudata Clute. Common in the eastern part.

Woodsia obtusa Torr. Sandy banks from Dallas, south and eastward. Also in Llano county.

Woodwardia angustifolia J. E. Smith. NARROW-LEAVED CHAIN FERN. Common in the eastern part.

Woodwardia Virginica J. E. Smith. COMMON CHAIN FERN. Common in the eastern part.

SCHIZAEACEÆ.

Anemia Mexicana Klotz. On rocky banks, common in the mountainous region north and west of San Antonio.

EQUISETACEÆ.

Equisetum robustum A. Br. Damp banks at Dallas.

Equisetum laevigatum A. Br. Inserted here upon the authority of A. A. Eaton in *Fern Bulletin* for April, 1903.

LYCOPODIACEÆ.

Lycopodium alopecuroides adpressum Chap. FOX-TAIL CLUB MOSS. In swamps in the eastern part.

SELAGINELLACEÆ.

Selaginella apus Spring. CREEPING SELAGINELLA. Wet places at the head of the Hondo in the southwest.

Selaginella arenicola Underw. In sand and among rocks in the granitic region of Llano.

Selaginella lepidophylla Spring. RESURRECTION PLANT. In the extreme west. Presidio county, *Neally, Havařd*.

Selaginella pilifera A. Br. Reported from Texas by Baker, but has not been seen since and possibly is incorrectly assigned to the State.

Selaginella Pringlei Bak. Chenates Mts.

Selaginella rupestris Spring. Dry exposed rocks in the southwest.

MARSILIACEÆ.

Marsilia macropoda Englm. In ponds in the southwest.

Marsilia tenuifolia Englm. Collected by Lindheimer on Pierdevales. I have a specimen collected in western Texas by J. Boll that seems to be this species.

Marsilia uncinata A. Br. Swamps, Dallas and eastward, common.

Marsilia vestita Hook. Swamps at Dallas.

SALVINIACEÆ.

Azolla Caroliniana Willd. On waters, Dallas and eastward.

IOSETACEÆ.

Isoetes melanopoda J. Gay. In wet sands, Dallas, rare.

NOTES ON AMERICAN FERNS—VI.*

BY WILLIAM R. MAXON.

A CRISTATE FORM OF THE GIANT CHAIN-FERN.—Not long ago I received from Mr. W. G. Watkins a specimen of *Woodwardia spinulosa* which I suppose to be very similar to a ramose form described by Mr. A. A. Eaton (FERN BULLETIN, IX: 87. 1901). The present specimen, collected by the sender on the banks of the El Dorado canal, near Placerville, California, December 5, 1902, showed the unusual feature of having the tips of all the pinnae and the apex of the frond itself many times divided, the former within the space of about an inch, forming divaricate crests. Mr. Watkins states that plants of this sort were numerous, growing in full sunlight, often to a height of more than five feet and in clumps fully three feet in diameter, in a light lava soil overlying an ancient river bed. The canal, it seems, was dug about forty years ago for mining purposes; the branch where the ferns grow having fallen into partial disuse, a considerable amount of vegetation has sprung up along its banks.

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Aside from the cristation I cannot see that the plant differs from ordinary *spinulosa*, and it is quite likely that this peculiarity has been induced by the abnormal conditions of habitat. Ferns deprived of their natural environment and grown under unusual exposure to sunlight or in excessive moisture or drought often take on odd forms; or to put it a little differently, inherent tendencies toward variation gain remarkable impetus directly upon modification of food supply, light supply and drainage. Oftentimes when sports occur in a wild state there is no unusual condition of environment apparent, nor need we assume that such a feature is *necessary*; but there are many instances in which evidently changed conditions appear as the *immediate* cause of unique forms. The present case seems such an one. Of common examples of this, one of the best known occurs in the Christmas fern (*Polystichum acrostichoides*), of which variously lobed and incised forms are known to be developed upon deforestation of the natural habitat.

ADIANTUM MODESTUM IN ARIZONA.—Specimens in the U. S. National Herbarium, collected by Mr. J. B. Leiberger (No. 5,968) in Arizona, "along the Bright Angel Trail; alt. 1,100 meters; September 10, 1901," agree well with the material from Roswell, New Mexico (F. S. and Esther F. Earle, No. 261) on which Dr. Underwood recently founded his *Adiantum modestum*. Other specimens from the same region seem to indicate that the line separating this from much of the other southwestern material still referred to *A. Capillus-veneris* is at best a doubtful boundary.

POLYSTICHUM MUNITUM SOLITARIUM, subsp. nov.—Similar to *P. munitum*; distinguished by the *dark* persistent chaff which very thickly covers the rachis throughout, and by the narrower and extremely coriaceous pinnæ which are more scurfy below, somewhat glaucous in appearance and possessed of *abbreviated* decidedly *cartilaginous* appressed incurved teeth.

Type in the Gray Herbarium; collected by A. W. Anthony on Guadalupe Island, Mexico (off the coast of Lower California) July to October, 1896 (No. 9). An imperfect sheet of the same collection and number is in the U. S. National Herbarium (No. 279,439), and Dr. Edward Palmer's No. 102, also from Guadalupe Island, is the same plant (Gray Herbarium).

The three specimens show such marked divergence from any of the material of the Pacific coast mainland that they might, perhaps, with more propriety be regarded as a distinct species. Indeed, the logic of naming the plants as a subspecies rather than a species may well be questioned, inasmuch as it is doubtful if intermediate specimens are extant. Certainly none have been seen. The darker, more copious chaff and the stiff texture and peculiar cartilaginous margins of the pinnæ are very marked characters; and several competent botanists to whom I have shown the material have not hesitated to express the opinion that it should be regarded as of specific rank. Nevertheless, the differences are only of degree and such as are to be expected of plants grown under the conditions.

Dr. Edward Palmer was the first collector to visit the island. His note on this species, published by Dr. Watson (*Proc. Am. Acad.*, XI: 120. 1876), in a report on the collection, runs as follows: "In large bunches; only two seen at the northern end in a rocky place inaccessible to goats, and constantly damp from the prevalent fogs." Dr. Edward L. Greene, in his study of the island's flora some ten years later, failed to detect the fern and lists (*Bull. Calif. Acad. Sci.*, I: 228. 1886) only the previous record. That it still persists is proven by Mr. Anthony's still more recent specimens.

THE GENUS *EQUISETUM* IN NORTH AMERICA.

By A. A. EATON.

THIRTEENTH PAPER.

E. LAEVIGATUM A. BR.

Rootstock granular, dull blackish, without felt; sheaths and young radicles densely felted or nearly naked; stems annual, from a few inches to four feet high, usually 12-18 inches, 1 to 4 lines in diameter, 10-30 angled, single or clustered, smooth or slightly roughened, commonly unbranched; angles rounded, with or without cross-bands of silex; no carinal groove; stomata in a single regular row on each side of the ridges, rarely double for a short distance, the grooves unarmed or with variously disposed cross-bands and dots of silex, or in one variety with rosu-

læ, the whole often overlaid with a coat of silex which makes it very smooth; lumen of epidermal cells wide, the edges little rayed; nodes contracted when dry; sheaths long, widened upward, the leaves keeled on the back for $\frac{1}{2}$ to 2-3 the height, then often flat, the edges often rising into ridges in those of the lower sheaths; teeth dark brown, the basal shining, usually cohering by the tops and torn off by the growth of the stem; when present they usually cohere by their tips into groups and fade to papery whiteness. They leave black, shining, rigid, centrally grooved, triangular, membranous bordered bases in falling which incurve at the tips and form a narrow black and white limb to the sheath.

Central cavity wide, occupying $\frac{3}{4}$ the diameter of the stem, the carinal usually small or often obsolete, the vallecular also small or medium. The vallecular bast cuts the green parenchym to the cavity, equaling or exceeding the carinal, which occupies a small triangle under the epidermis of the keel, the green parenchym thus being of a Y-shape between and above the vallecular holes. A section of the sheaths shows a linear streak of green parenchyma each side of the bast which corresponds to the carinal hole of the stems. Spikes included in the upper sheaths or slightly exerted, rounded, or slightly apiculate.

This species can readily be separated from *robustum*, with which it grows, by its longer, spreading sheaths, its annual stems, and especially its anatomy, the vallecular bast being larger than the carinal, while in *robustum* this is reversed, the carinal bast extending nearly to the carinal hole, the vallecular bast being small and the green parenchyma continuous between it and the hole. The section of this is very like that of *variegatum* and *ramosissimum*, but the former has a very small central hole and the latter is intermediate. Indeed, there appears to be a regular gradation from *variegatum*, through the round-angled variety *Nelsoni* to this species and *ramosissimum*, and at times it is difficult to draw the line. Milde had an imperfect idea of this species and figured (Mon. I., XXXII., fig. 3) a species with two-angled ridge and stout carinal bast. I am not certain as to the identity of his plant, but it is assuredly not *laevigatum*.

This species was classed with *hiemale* by Milde, but all its affinities are those of *ramosissimum*, and it is probable that it has been taken for that species. The secondary stems are rough and without a microscopic comparison would easily pass for small forms of that species. The stems appear to be strictly annual. Not one of the several hundred specimens I have seen has a stem a year old, and I have been unable to find a person who has seen it in early spring. Rev. J. M. Bates, of Callaway, Neb., says he has not seen it in spring over two or three inches high. Specimens collected in July or August usually have dead or dying tops. It fruits mostly in May, but may develop secondary stems later and continue its fruiting into mid-summer. Only one label of all I have seen calls it annual.

It was described by Alexander Braun from South Carolina, Louisiana and Missouri, and is now accredited to New Jersey, Virginia, and the West generally. I have seen only four specimens from east of the Mississippi, one each from Illinois, Wisconsin, Indiana and Ohio. It is possible that Braun's species is composite and it is desirable to verify the eastern localities. It is most common on the sandy bottom lands of the arid regions of the West, where it is an important forage plant. It extends from Texas and Southern California to British Columbia and Assiniboia. It is peculiar to North America and has not yet been seen from Mexico. I find it fairly constant in characters, but it presents several forms of note.

The roughness of the stems is quite variable, though never great except in small stems or branches. The stems when young are usually very rough, but the asperities are soon covered by a coating of siliceous matter, and the markings may often be seen under the surface even when smooth to the touch.

VARIETIES.

1. *Scabrellum* Eng. Ridges prominent, rough with small cross-bands of siliceous matter, leaflets convex in the middle and with two lateral rough ridges above, teeth subulate, black at base, membranous at borders, mostly persistent. This is essentially Engelmann's description. I would add that the stems often look rough, even without a lens, when tolerably smooth to the touch. At times the whole epidermis is completely covered with short bands and spots of siliceous matter. It is not uncommon to find a few very

rough plants in a colony of normal ones. but forms combining all of Engelmann's points are rare. Type, Newburn, N. C., and Kentucky.

2. *Elatum* Eng. Very tall, 3-4 feet high. Sheaths with about 30 leaflets, the points linear-lanceolate, membranous, irregularly deciduous, leaving a torn, blunt, black base. Newburn, N. C., Kentucky.

3. *Ramosum* forma nov. Stout. 3 to 4 lines thick, $1\frac{1}{2}$ to 3 feet tall, oftenest very smooth; internodes 4 to 5 inches long. sheaths tighter, funnel form above in sterile plants, with 25 to 30 narrow linear leaves, those of the lower sheaths keeled below, concave above, those of the upper rounded on the back; teeth deciduous or persistent and finally hyaline; the black base often fading and the sheaths taking on a flesh tint. Branches appearing with the spikes in whorls of 2 to 6, becoming 7 to 10 inches long, about a line wide, 7 to 9 angled, carinal holes small or obsolete, the vallicular small; sheaths with persistent teeth or with the upper, subulate half deciduous, the remaining part horny, black, centrally grooved, the groove decurrent into the leaf. Type. Callaway, Neb., *Rev. J. M. Bates*; Oak Creek, North Arizona. *Dr. McDougal*, 482 (Nat. Herb., 25,979); Unionville, Nev., *Watson*, 1,355, King Expedition, sheaths with black girdle at base. Albuquerque, N. Mex., *Tracy and Evans*; Wessels' Ranch, near Lewiston, Idaho, *Henderson*. Some of Bates' and McDougal's plants have no vallicular holes in the upper part of the stem.

4. *Caespitosum* forma nov. Stems several to many, mostly small and rough, at times clustered around a larger central one; teeth persistent, fading, flexuous; fruiting in July. Apparently formed by a second growth springing up after the early stems have fruited. Callaway, Neb., *Rev. J. M. Bates*.

5. *Variegatoides* forma nov. Low, cespitose, prostrate or ascending, 3 to 10 inches long, $\frac{1}{2}$ to $1\frac{1}{2}$ lines in diameter, prominently 6 to 12 angled, very rough with prominent, sharp cross-walls of silex, both on the ridges and in the grooves. Sheaths elongated, little widened, usually contracted at the mouth; leaves rounded on the back, with or without a shallow central groove in the upper part, eventually becoming white in whole or in part; teeth persistent or only the subulate upper half

deciduous, leaving a wide, membranous bordered lanceolate base which soon fades into a papery whiteness. Fruit-spike as in the species. This is the roughest equisetum I have seen with the exception of *Funstoni*. Usually six to many small stems arise from the top of a rhizome or about the base of an old stem of the previous year. Many of them are prostrate, others ascending or erect.

This form has repeatedly been taken for *variegatum* and numerous collections given out for the latter species have been found to be this, *Funstoni* or *hiemale intermedium*. *Variegatum* is certainly rare outside the forest regions of the northern part of the United States, and all localities south of Montana and Washington need verification. Wet Meadows, Middle Loup River, Neb., *Rydberg*, Type; Lauer Creek, Wyo., *Knowlton*; Meade, Kas., *Smythe*; Springdale, Utah, *Jones*; Rockport, Kas., *Bartholomew*; Snake River, Wyo., *A. and E. Nelson*; Elkhart Lake, Wis., *J. H. Shuette*; Callaway, Neb., *Rev. J. M. Bates*. Carson, Nev., *Baker*, is abnormal in having rosulæ in the grooves.

6. *Polystachyum* f. nov. Like No. 3, but branches of upper 3 whorls ending in spikes contemporary with the fruit on the main stem. I have seen but one specimen of this, collected at Callaway, Neb., by *Rev. J. B. Bates*, in July, 1902.

The Ames Botanical Laboratory, N. Easton, Mass.

EQUISETUM SCIRPOIDES IN CONNECTICUT.

By A. VINCENT OSMUN.

That this plant is considered rare probably because overlooked, has been somewhat exemplified in my experience of the past summer. According to Bishop's "List of Connecticut Plants," Norfolk is the only town in the Nutmeg State where *E. scirpoides* has been found. *E. variegatum* was reported as growing in Canaan; but doubtless *Scirpoides* was mistaken for this more northerly and rarer species. Early in June, the writer, while fishing a trout brook in the town of Sharon, came upon a large patch of *scirpoides* on the bank of the brook. A visit to the place late in August revealed an area of nearly two acres almost completely covered with the little plant. Shortly thereafter

a friend brought me a few of the plants, which he had found during a tramp through woods in the town of Cornwall. And later another colony was found perhaps a half mile from the last. A more thorough search of Western Connecticut probably would reveal other localities for this species.

When first discovered (early in June), neither fruit nor buds could be found; but when the Sharon station was visited in August there was an abundance of buds. Some of these had aborted; others, which were quite large and somewhat longer, when examined with a lens, seemed to be normal and only a few weeks from maturity; but the greatest number were in the form of little black knobs at the ends of the stems. Apparently in this undeveloped state most of the fruit buds pass the winter, maturing in very early spring. But I am convinced that this species *does* mature some of its fruit in late summer or early fall in Southern New England. Perhaps this will account for the disagreement regarding the time of fruiting of *Scirpoides*. Mr. Grout has found that in Northern Vermont the fruit matures in the spring soon after the last snow disappears. Gray's Manual has it: "Fruiting in summer." My experience indicates that both are right.

E. scirpoides seems to favor moist, thickly wooded hillsides for its place of abode, although Mr. Grout found it in a cold, boggy meadow. The place where first I saw this plant is a steep hillside thickly grown up to hemlock and white pine. Underneath the little *Taxus* or Ground Hemlock grows in abundance and *Streptopus roseus* or twisted stalks the showy orchis, red trillium and the round-leaved violet (*V. rotundifolia*), are its companions. Here the bulbiferous bladder fern makes most luxuriant growths, forming beautiful tangles over the small boulders and fallen trees. The little oak fern (*Phegopteris Dryopteris*) also is abundant in this wood.

The first station found in Cornwall is of the same general character, though not so rich in vegetation. The second place is not so deeply shaded and is drier. The plant was found to be most freely budded in the dampest place, which would seem to indicate that an abundance of moisture is favorable to the fruiting.

The manner of growth of *Scirpoides* is a little peculiar. The stems are short, slender and very much flexed, the sterile ones generally recurving at the top. The end of the stem bearing the fertile spike seldom bends over until the fruit is nearly matured, the little black knob-like bud usually pointing upward. When dried most of the stems recurve and some even bend into circles or double circles. From the slender rootstock the simple stems grow in small clusters or tufts. The plants spread by means of the creeping rootstock, forming great masses which make a soft mat over the ground. It is hoped that the time of fruiting of this species will be closely watched by others and reported upon. The writer has specimens of *E. scirpoides* for exchange.

Brooklyn, N. Y.

FERNWORT NOTES.—II.

BY WILLARD N. CLUTE.

NEPHRODIUM UNITUM GLABRUM IN FLORIDA.—In recording *Neprodium unitum glabrum* from Sanford, Fla., it was noted that no other exact locality for the plant in the State had been given. Mrs. E. C. Anthony has since informed me that she found it growing abundantly on both branches of the Miami river, near the Everglades. The fern is apparently widely distributed, and further notes of its occurrence are desirable.

GYMNOGRAMME TRIANGULARIS IN ALASKA.—In *Torreya* for January Professor Underwood referred to this fern as growing in Alaska, but without definite data as to locality. Since Alaska is not included in its range in the latest edition of "Our Native Ferns," and since it is not listed from that part of the world in either Maxon's or Gilbert's lists, some curiosity may be expressed regarding it. Eaton's "Ferns of North America" gives its known northern range as Oregon and suggests the possibility that it may be found beyond. This, in fact, has been done by Mr. J. B. Flett, who found it in Washington. "Synopsis Filicum" reports it from Vancouver Island, but this last may be an error due to the mixing of specimens.

THE ALLIANCE OF LYCOPODIUM LUCIDULUM.—Among the common club mosses of the Eastern States, there are none that

appear to have less in common with the others than *Lycopodium lucidulum*. It is, therefore, surprising to find in an account of a visit to Mount Ktaadn by L. H. Harvey, in *Rhodora* for February, the note that *Lycopodium selago* imperceptibly grades into this species from the summit downward. The conclusion is made that "*L. selago* is apparently a xerophytic form of *L. lucidulum*, which replaces it in more mesophytic habitats. All transitions were found varying with the environment." This puts the relation of these two plants in a new light, and those who have access to regions where *selago* is found will do fern students a favor by reporting how their own observations tally with it. If *lucidulum* intergrades with *selago* this explains the origin of *lucidulum* in Washington, which was recently reported. It may also be observed in this connection that *L. porophyllum*, lately described, whose habitat is dryish rocks, is a close ally of *lucidulum* and probably is only another form of the same species. How the nomenclature of the group will be disposed of is an interesting problem. *Selago* having been described first, *lucidulum* ought to be named *L. selago lucidulum*, and the other *L. selago porophyllum*. Probably, however, the extremes will always be maintained as distinct species, notwithstanding the intergrades.

RAISING NEPHROLEPIS FROM SPORES.

In answer to the query as to success in raising *Nephrolepis exaltata* from spores, I will say that, given the right conditions, it is quite easily raised. One must bear in mind that the species is arboreal, growing in moss, on trees and limbs. In the orchid houses of Mr. Oakes Ames, at North Easton, Mass., the plants are set in *Osmunda* fibre, mixed with sphagnum moss. Spores from the adjoining fern-house alight on this and readily germinate. One of the predominant species is *Nephrolepis*, which is quite a weed. Sporelings of this species can always be separated from plants raised from runners because the pinnæ are crisped and the margin bristly with the excurrent nerves. These characters disappear on maturity.—A. A. Eaton, Ames Botanical Laboratory, North Easton, Mass.

NEW FORMS OF FERNS.

BY CHARLES T. DRUERY.

Mr. Willard N. Clute's note in the BULLETIN for last July anent a new form of *Dicksonia pilosiuscula* leads me to enter a protest against solitary new finds being treated as mere herbarium material. I note that all the fronds (ten) were taken, and that later in the season, six more were secured. The finder who deliberately denudes a fern of its fronds twice in a season will be nine times out of ten its destroyer, and the fern world robbed of a great possibility (for wild sports become occasionally the progenitors of marvelously developed and improved types) in order that a few herbaria may be enriched with dead fronds and practical epitaphs.

I am the more moved to this protest as I have recently heard of similar cases elsewhere, where absolutely unique and hitherto unknown varieties of unusual merit have been found as solitary examples. Knowing the finder of one of these, I instantly wrote, begging for spores or a division on exchange lines, only to hear that the plant was left in situ and fronds (sterile) alone taken, all chance of propagating them being thus thrown away. Further, the locality was indicated to another friend who also took fronds for his herbarium, each man thus doing the very opposite of what he should by contributing to the destruction of the "find" instead of its perpetuation.

Now, for the other side. In 1881 I found in a remote part of Exmoor a perfectly new form of *Blechnum spicant* (*B. s. concinnum* Druery). It was a small plant, solitary as to type, and bore only six barren fronds. I carefully extracted it, freed it from the bunch of normals from which an extreme frond tip had only emerged to catch my eye, as it were, beseechingly, wrapped it in damp moss, took it home and potted it up. The next season it bore spores. I sowed these and subsequently distributed three hundred typical specimens, so that it is now open to any one to acquire it. *Lastrea aemula cristata* afforded a similar case. The finder failed to raise it, and it remained for the writer again to secure a future for it by wide distribution. This, I maintain, is the absolute duty of any fern

lover who is favored by fortune with such discoveries. No one is a greater foe to vandalism than myself, but this is not vandalism, while mere herbarium accumulations are too often the spoil of such where plants are rare. The procedure I advocate is, furthermore, rewarded by the possibility of exchanging the progeny of the finds for other collectors' acquisitions. A good thing thus rewards its protector and propagator by becoming a little mine, as it were, to its owner, and thus in the long run the fern world is enriched all round instead of being impoverished.

A few days ago I was the fortunate finder of a clump of *Lastrea montana plumosa*, a fine-cut sterile form, of which only four have been found in half a century. I was with a party of five. We dug it up and found it had only four crowns. The find was mine, but I at once divided it, distributing it by ballot as there was a crown short, and now I know when I visit these friends some day, I shall see, not one weather beaten clump on a bleak mountain side obviously out of human ken for decades, but several fine specimens probably outrivaling my own at home, while already I am the happy recipient of several gems in exchange. I put it now to your readers, which is the preferable method?

[The answer to Mr. Druery's query depends somewhat upon whether we admire ferns for pure leaves, or whether we collect them for study. Students of ferns know that many fern forms are due merely to varying conditions of soil, light, moisture, etc., and are inclined to pay very little attention to them. The editor has seen many of these variants growing wild, and they may be growing there yet, so far as his operations are concerned. For ten years he has known of a most unique form of the Christmas fern in the possession of a member of the Fern Chapter, that has never been described. We know that many people are cultivating these abnormalities, and such plants are not uncommon in American greenhouses, though usually of British origin; but the aberrant forms on this side are not made much of simply because the average student looks upon them with much the same feeling as he would upon a seven-toed kitten or a two-headed rabbit. Indeed, there are plenty of botanists here who prefer a wild rose or buttercup to all the gar-

dener's many-petalled creations. If Mr. Druery will visit "the States" we will take pleasure in turning over to him all our abnormal specimens.—Ed.]

ROBERT ROBINSON SCOTT.

About forty years ago the first specimens of the fern known as *Asplenium ebenoides* were found, and since then the plant has obtained a place in all botanical manuals as a distinct species. Notwithstanding this, it has often been suggested that its appearance indicates a hybrid origin, the supposed parents being *Asplenium ebeneum* and *Camptosorus rhizophyllus*. This supposition having recently been proved to be the correct one, and attention again drawn to the fern, we take pleasure in presenting a portrait of R. R. Scott, who first discovered it, and of adding the following biographical sketch by Mr. Edwin C. Jellett. The photograph from which the engraving was made is the only one ever taken of Scott, and was secured for us through the courtesy of Mr. Jellett.

R. Robinson Scott, like many of our best gardeners and botanists, came from the "old country," where, at Belfast, Ireland, he was born in the year 1827. In his youth, being fond of flowers, he resolved to devote himself to horticulture and botany, and in pursuit of his plans, connected himself with the Botanic Garden of Glasneven, near Dublin, where he followed the prescribed course of studies. From Glasneven he went to Kew, in England, and there he made such progress that in a few months, it is said, "he was familiar with every plant in the Kew Garden collection."

Being of an enthusiastic temperament, at the breaking out of the Smith O'Brien Rebellion, he abandoned botanical pursuits temporarily, and took an active part in the struggle. At the close of the Rebellion, he decided to settle in America, and came to Philadelphia, where he entered the employ of Robert Buist. Being ambitious and possessing strong literary talents, he soon launched out for himself, and in April, 1852, he presented to the public the first issue of "The Philadelphia Florist," a magazine, which, if it had proved as successful financially as it was successful in other respects, would have left, as Professor Meehan

wrote, "no room in the United States for another magazine of like character." After living for three years the magazine was discontinued, owing to lack of sufficient support. Relieved of the burden of publication, Scott continued his literary labors by writing for the prominent agricultural and horticultural papers of the day. Scott also did work of a more permanent character, and the "Year Book of the Farm and Garden for 1860," published by A. M. Spangler, was written almost in its entirety by him. Scott's style was good and what he wrote was illumined by knowledge outside of that required in the immediate object, so that, while thoroughly reliable, his work possessed in addition a quality which few of his contemporaries could equal. Scott carried on his literary work while he acted professionally as landscape gardener and as agent for scientific magazines and books.

About 1857 Scott left Philadelphia and became associated with Elwanger & Barry at Rochester, N. Y., continuing with this firm and taking an active part in the New York annual horticultural conventions until about 1860, when he returned to Philadelphia to take charge as head gardener of a large estate. Near this estate, and on the west bank of the Schuylkill river, near Manayunk, Scott discovered the fern which has become inseparably connected with his name.

Scott's spleenwort was first exhibited at a meeting of the "Pennsylvania Horticultural Society," at Philadelphia, and Scott himself wrote a description of it which appeared in the *Gardeners' Monthly* of September, 1865, three years after the fern was found.

Throughout Scott's life in America his work was at intervals interrupted by sickness resulting from an injury he received in childhood. With increasing years and consequent increasing lack of resistance, these visitations became more frequent and more serious. He died June 24, 1877, at Harrisburg, Pa., in his 51st year, an immeasurable loss to American Horticulture.

MISCELLANEOUS NOTES.

Professors L. R. Jones and F. A. Rich have found that the common horsetail (*Equisetum arvense*) is poisonous to horses when it is mixed with the hay though the horses feed upon the green plant with impunity. Among Vermont names for this plant we note coltstail, foxtail, pine-top, pine-grass, meadow pine, jointed rush and snake-grass.

* *

Mr. C. E. Waters, long known for his work among the ferns, has in preparation a book on the subject, which will be entitled "Ferns." It will contain a large number of photographs, including illustrations of the genera of American ferns, and a chapter on fern photography. There will be keys based upon the arrangement of the tissues in the stipe and upon the fruit, besides more or less matter of a popular nature.

* *

The variety of the common cinnamon fern, *Osmunda cinnamomea glandulosa*, described by C. E. Waters, in a recent issue of THE FERN BULLETIN, occurs in the Pine Barrens of New Jersey. I never happened to notice it until September of this year, when an inquiry from Mr. Waters sent me in search of it. Good specimens of it were found near Clementon, N. J., growing just as Mr. Waters found it in Maryland, in low woods with the type and with both *Woodwardias* not far off.—C. F. Saunders.

* *

In a recent memoir of the Torrey Botanical Club, there is a key to the North American species of *Vittaria* founded on the shape of the spores, paraphyses and scales. While it is an excellent thing to have several ways of arriving at the identity of a species it is to be hoped that keys like the one mentioned will not become the principal ones for identifying plants. The fern students' dislike of a compound microscope in identifying ferns must not be set down entirely to mere indolence. The shape of spores and cells may be well enough for microscopic things, but when ferns are so nearly alike that a compound microscope is necessary to distinguish them, it would be just as well to call them the same species.

INDEX TO CURRENT LITERATURE RELATING TO FERNS.

Readers are requested to call our attention to any omissions from this list.

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CLUTE, W. N. *Recently Discovered Species and Forms.* Fern Bulletin. Ja. 1903.

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COCKS, R. S. *Equisetum robustum,* A. Br. 1844. Fern Bulletin. Ja. 1903.

EATON, A. A. *The Genus Equisetum in North America.* Fern Bulletin. Ja. 1903.

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——— *Japanese Fern Balls.* American Botanist. Ja. 1903.

——— *The Wool on the Cinnamon Fern.* American Botanist. Ja. 1903.

LIST OF FERNWORTS COLLECTED IN JAMAICA.

BY WILLARD N. CLUTE.

(Concluded.)

SAGENIA Presl.

150. *S. cicutaria* (Sw.) Shaded banks at Port Antonio. All my specimens are very small and should doubtless be referred to variety *Nana*, Eaton.

151. *S. apiifolia* (Schk.) In shade above Moore Town. Common. (261).

152. *S. macrophylla* (Sw.) On moist banks above Moore Town and at several other places. (260).

NEPHROLEPIS Schott.

153. *N. pectinata* Schott. On stony banks at Cinchona. Common. (185).

154. *N. sesquipedale* Jenm. Rio Grande. Not common. (269).

155. *N. cordifolia* Presl. Moody's Gap. Common. (171).

156. *N. bisserata* Schott. On trees or earth, Port Antonio. Often six feet in length and more than a foot wide. A magnificent "sword fern." (57).

FADYENIA Hook.

157. *F. prolifera* Hook. Cuna Cuna Gap and Bath Fountain. Common on wet clay banks. Fronds of three shapes: fertile, paddle-shaped; sterile obovate; others lanceolate, prolonged into a slender tip which roots to form new plants. (285).

POLYPODIUM L.

158. *P. Fawcettii* Baker. Very rare. Among mosses on trunks at New Haven Gap. (125).
159. *P. gramineum* Sw. Among mosses, growing erect from the slender branches of trees. Not uncommon. John Crow Peak. (77).
160. *P. marginellum* Sw. Among mosses on the trees in elevated regions around Cinchona. Plants only a few inches high. (124).
161. *P. serrulatum* Mett. Abundant on shaded banks, growing as thickly as grass. A very diminutive species. (45).
162. *P. trichomanoides* Sw. Common on horizontal branches in all the elevated regions. (78).
163. *P. rigescens* Bory. New Haven Gap on trunks of trees. Not common. (111).
164. *P. cultratum* Willd. On trees and under overhanging rocks. Morce's Gap. Fronds soft and flexible, clothed with reddish hairs. Quite variable, my specimens being referable to the varieties *brachyphyllum* and *elasticum*. (58).
165. *P. graveolens* Baker. New Haven Gap. Usually on horizontal boughs. A mass of dead fronds generally depend from the rootstock, beneath the living ones. (97).
166. *P. curvatum*. Sw. On trees, New Haven Gap. Not common. Fronds thick and very brittle, when fresh.
167. *P. trifuratum* L. Mabess River. Rare. The fronds are not three-forked as the name would indicate. (320).
168. *P. suspensum*. L. Morce's Gap, on the trunks of trees. Stipes erect, blade pendant. (51).
169. *P. brunneo-viride* Baker. New Haven Gap. Rare. Growing on trees and easily mistaken for the preceding, but the blades are erect and the veins are forked. (79).
170. *P. plumula* H. B. K. Cinchona. Common on open banks. Very similar in appearance to the following species. (113).

171. *P. pectinata* L. Open banks. Cinchona. A much larger form with slightly oblong sori was collected at Cedar Valley and may be *P. paradisae*. (158).
172. *P. dissimile* L. Rio Grande. On trees with *P. chnoodes* which it superficially resembles. (277a).
173. *P. incanum* Sw. Abundant on trees, rocks, open banks and the roofs of houses from sea level to the mountain tops. (169).
174. *P. thysanolepis* R. Br. Half shady banks at Cinchona. In dry weather this species curls up like *P. incanum*.
175. *P. squamatum* L. With the two preceding species at Cinchona. Only one specimen collected. (372).
176. *P. loriceum* L. Clambering over trees and earth at Cinchona. Most abundant. The fronds are similar in appearance to those of *P. vulgare*. Rhizomes long and very brittle. Fronds usually horizontal. (86).
177. *P. chnoodes* Spreng. Pendant from trees at Rio Grande. A soft pubescent species, at first glance likely to be mistaken for *Nephrolepis*. (277).
178. *P. aureum* L. Cuna Cuna Gap, on Palm trees. The variety *arcolatum* H. B. K. with both sides of the frond glaucous was collected along roadsides at Cedar Valley. (157).
179. *P. decumanum* Willd. Cedar Valley. Not common. Closely resembles the preceding. (155).
180. *P. crassifolium* L. Morce's Gap. Abundant. Distinguished from the following by its greater size. This species also loves higher altitudes than *Phyllitidis*.
181. *P. phyllitidis* L. Plentiful on earth or trees, Cedar Valley. Resembles *P. crassifolium* very closely except in size of frond and fruit-dots. (172).
182. *P. repens* L. Morce's Gap. Trailing over rocks and trees. Fronds half erect. (55).
183. *P. angustifolium* Sw. Pendant from trees and rocks. Common at Cedar Valley. (165).
184. *P. piloselloides* L. On trunks, rocks and fallen trees in all moist places. Rootstock extensively creeping, (248).

185. *P. vacciniifolium* Fisch. & Lang. On trunks of trees at Port Antonio growing with *P. lycopodioides*. Rare.
186. *P. lycopodioides* L. On trees, Port Antonio. Larger than *piloselloides* but much like it in appearance and habitat. (151).
187. *P. lanceolatum* L. Open banks in dry or wet soil. Common. (67). A form growing at Cinchona with deeply lobed fronds was named variety *Elizabethae* by Jenman. I have similar specimens from South Africa and think it perhaps entitled to specific rank.

MENISCIMUM Schreb.

188. *M. angustifolium* Willd. Moist shady places. Not common. Rio Grande. (270).
189. *M. reticulatum* Sw. In moist open places, Cedar Valley. In habit and habitat, suggesting *Osmunda cinnamomea*. (149).

GYMNOGRAMME Desv.

190. *G. rufa* Desv. Common on dry banks in full sun. Gordon Town. Fronds soft and woolly but usually curled up on account of the dryness. (302).
191. *G. gracilis* Hew. New Haven Gap, in woodlands. This species is much like the ordinary *Nephrodium* in appearance and quite unlike the more abundant species of its genus, except in fruiting. (205).
192. *G. triangulata* Jenm. Moody's Gap. Said to be the only known station for the plant. (162).
193. *G. trifoliata* Desv. Not common. Along Hope river above Gordon Town. A singular species with horizontal, three-parted pinnae that appear like six rows of pinnules when viewed in the direction of the rachis. (238).
194. *G. tartarea* Desv. Cinchona on dry sunny banks. Very common. Under side of fronds covered with silvery white farina. (307).
195. *G. calomelanos* Kaulf. Dry banks at Gordon Town. Much like *tartarea* but with sharper segments and yellow farina. A variable species. A blunt lobed form also collected. (308).

196. *G. sulphurea* Desv. A handsome and most abundant species in ravines above Gordon Town. Fronds with bright yellow farina. (231).

HEMIONITIS L.

197. *H. palmata* L. Common on banks, dry or wet, at low altitudes. Cedar Valley. Fronds star shaped, covered with rusty tomentum. Young plants grow from buds on the edges of the old leaves. In dry weather the fronds curl up, but unroll again when it rains. Called star fern and strawberry fern. (168).

ANTROPHYUM Kaulf.

198. *A. lineatum* Kaulf. On damp rocks. Clyde river. Common. (141).
199. *A. lanceolatum* Kaulf. On trees at Cedar Valley, the fronds pendulous. (174).

VITTARIA Sw.

200. *V. remota* Fee. On trees at Cuna Cuna Gap. Not common. (302).
201. *V. lineata* Sw. Abundant on the branches of trees at low elevations. Moore Town. (273).

TAENITIS Sw.

202. *T. Swartzii* Jenm. Rare, on trees at Port Antonio. Very much like *Polypodium lycopodioides* in appearance. (315).
203. *T. angustifolia* R. Br. Not uncommon on the branches of trees. Above Moore Town. (278).
204. *T. lanceolata*. R. Br. On trees at Cuna Cuna Gap. Not common. (288).

ACROSTICHUM L.

205. *A. simplex* Sw. New Haven Gap, rare. In appearance like a small form of *A. tectum*. (313a).
206. *A. inaequalifolium* Jenm. Open banks at New Haven Gap, growing with *A. viscosum*. (313).
207. *A. alatum* Fee. Near Cinchona, rare. (268a).
208. *A. chartaceum* Baker. On fallen trees, New Haven Gap. Not uncommon. (207a).
209. *A. pallidum* Baker. Cinchona, on rocky banks. Fronds much like those of *Scolopendrium* in appearance. Small forms have ovate fronds. (176).

210. *A. latifolium* Sw. Morce's Gap, common. (85).
211. *A. viscosum* Sw. New Haven Gap on sunny banks. (312).
212. *A. Huacsaro* Rinz. Open banks at Cinchona, common. (82).
213. *A. tectum* Willd. On open banks at Cinchona. Most abundant, often growing as thickly as grain. (65).
214. *A. lepidotum* Willd. Cinchona, on rocky exposed banks. Very abundant. (66).
215. *A. squainosum* Sw. On trees, New Haven Gap. Fronds densely covered with red-brown scales that become black margined when old. (310).
216. *A. crinitum* L. Cuna Cuna Gap, not uncommon. Fronds orbicular, entire, covered with long, hairlike scales. Called elephant's ear. According to Jenman this is the largest entire frond in the American fern flora. (309).
217. *A. peltatum* Sw. Mabess river and John Crow mountain. Rootstock wide creeping and fronds much divided. The plant is much like a diminutive specimen of *Lycopodium complanatum* in appearance. Fertile fronds usually entire, roundish. Called peacock fern. (83).
218. *A. osmundaceum* Hook. Rare. Rio Grande and Cuna Cuna Gap. Climbs perpendicularly up the trunks of trees for many feet. Fronds very large, deltoid; rhizome rather slender. (259).
219. *A. cervinum*. Sw. Cuna Cuna Gap, not uncommon. Fertile fronds bear sporangia on both surfaces. Called ginger fern from the appearance of the sterile fronds. (296).
220. *A. nicotinaefolium* Sw. Moist hillside at Bath Fountain, plentiful. (283).
221. *A. aureum* L. Abundant in lagoons at Port Antonio. Suggests our cinnamon fern in both habit and habitat. Fruiting fronds fertile only toward the tips.
222. *A. lomarioides* Jenm. Yallahs river in lagoons with the preceding from which it is easily distinguished by the fruiting fronds which are wholly fertile.

EDITORIAL.

Among the interesting facts brought out by Mr. Reverchon's "Fern Flora of Texas," in this number, is the meeting of two distinct floras in the State. The *Aspleniums*, *Nephrodiums*, *Lycopodiums* and other species of moist shades are but poorly represented, while there is a remarkable increase of dry rock ferns such as *Cheilanthes*, *Notholaena* and *Pellaea*. One familiar with the habitats of ferns need only run through the names of the species to get a fair idea of the Texas climate. As Mr. Reverchon intimates, the State is too large for a single student to map out its fern flora accurately, and it is hoped that our readers will contribute further notes on the subject. We now have ready or in course of preparation the fern-flora of California, by S. B. Parish; of Florida, by A. H. Curtiss; Georgia, by R. M. Harper; Mississippi, by S. M. Tracy; Connecticut, by C. H. Bissell; New York, by B. D. Gilbert; Vermont, by W. W. Eggleston; Kentucky, by Miss Sadie F. Price; Iowa, by T. J. Fitzpatrick, and Washington, by J. B. Flett. The fern floras of other States will be announced later. It is hoped that most of those named above will be published this year.

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In the February number of *Torreya*, Prof. L. M. Underwood states that after a study of specimens of the royal fern from both Europe and America, growing side by side in the New York Botanical Garden, he has concluded that the American plant is different from the European one, and accordingly he would now call our plant *Osmunda spectabilis* Willd., instead of *O. regalis* L. It happens that the very plants Professor Underwood is writing of, were set out by the editor of the FERN BULLETIN, and the latter having had not a little chance to see them growing side by side from the first unrolling frond of spring to the last naked rachis of autumn, *does not* believe that they are different species. This does not imply that Professor Underwood is wrong, but it does intimate that there is a possibility of a difference of opinion on the subject. The European plant, it must be admitted, presents some slight superficial differences, but these are no greater than one would expect to find in two plants from

stations more than three thousand miles apart. If our American fern is to have a new name at all, surely it should be a trinomial as *Osmunda regalis spectabilis*. *Osmunda regalis* may then be taken to represent the species and *spectabilis* to stand for a lighter shade of color and a fraction of a millimeter less in the thickness of the leaves.

* *
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Through all the changes that have been made in fern names we have felt pretty sure of the names of three species—*Osmunda regalis*, *Polypodium vulgare* and *Pteris aquilina*; others might change, but these so abundant, so distinct, so common as to be known to every botanist on both sides of the Atlantic, seemed to wave defiance to the species makers with every passing breeze. But alas for human ideas of stability! Two of these are already doomed and the other is probably trembling in the balance. In some accounts it is said that the fronds of the British polypody wither at the approach of winter; the fronds of ours do not and of course it must be a distinct species—at least we offer this tip to the species makers. But it is not the polypody that is referred to as doomed, but the bracken. In the same number of *Torrey* our bracken is spoken of as *Pteris latiuscula*, for the experts have decided that this is not the Old World fern. But if it is not, why, oh why did not those acute botanists of other days settle the matter for all time instead of allowing it to be bandied about “from pillar to post” in these strenuous times? For be it known that this poor species has had trouble on both sides. First, its generic name was tampered with and now the specific gets its turn. Truly, certain phases of botany move with great rapidity even if they do not get anywhere. Things have actually come to such a pass that the common name of a plant has greater stability than the scientific ones and is known much further.

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There is a certain very common form of the bracken in the Southern States that extends northward along the coast to Long Island which, until recently, was called *caudata*, being confused with the true *Pteris caudata* of the tropics. It is not the true *caudata*, however, but is connected to the common bracken by

numerous intergrading forms. It has, therefore, been given its rightful place as a form of the latter and is now called *Pteris aquilina pseudocaudata*. But the name does not go unchallenged. The author of six editions of "Our Native Ferns" has recently made the astounding statement that "we have assigned it no place in Dr. Small's forthcoming flora because of present uncertainty regarding its specific or varietal limits." Since Dr. Small's flora covers the very region where this form is the prevailing one, it would seem much better to have given it some designation, perhaps *Pteris latiuscula pseudocaudata*, if no other could be found. "When in doubt do nothing" is not always a safe maxim in botany.

* *

There are about eighty fern species and varieties east of the Mississippi river and north of the Gulf States, and forty-three of these, or more than half, have had a change of name in the past ten years, and some few have had more than one. Once upon a time the editor of the FERN BULLETIN, being assured that the adoption of these new names would mean stability, followed the lead; but as change succeeded change, it became more apparent that under the rules laid down there could be no stability, and he returned to the nomenclature that is most widely used, namely, that established by Hooker and Baker. This may not be a perfect system, but we find that by using Hooker and Baker's names we are understood in every country where English, French or German is spoken, and that is more than can be said of any other brand of nomenclature. The principal feature of American nomenclature is its instability, and one of its distinguishing characteristics, its unlikeness to any other. The aim of nomenclature, as we understand it, is to give a name to each species by which it can be known throughout the world. Any system that tends to upset old established names is, we believe, a harmful one. It is sheer nonsense to say that all questions regarding the "new" nomenclature have been settled in view of what has happened to our fern names; but if anyone can defend these changes, we shall be glad to give them space in this journal for the purpose. Since this paragraph will fall under the eyes of every botanist of note in America, it is possible some apostle of the

new order of things will tell us what we have gained by calling our plants by new and strange names that are not recognized by the great body of students in other parts of the world.

BOOK NEWS.

The reviewer is indebted to C. W. Hope, Esq., for a set of his reprints of the "Ferns of Northwestern India," which is being published in the *Journal* of the Bombay Natural History Society. Some idea of Mr. Hope's fitness for this task may be gained from the fact that his first collections of Indian ferns were made more than forty years ago. He has also been fortunate in securing the assistance and in viewing the collections of practically all who have since collected there. Some two hundred species are described, many of them new, and there are a number of excellent plates illustrating them. Mr. Hope follows the nomenclature of Hooker and Baker's "Synopsis Filicum," but is rather less conservative in the treatment of species and varieties, though by no means to be classed as a radical. It is to be regretted that the place of publication makes it somewhat difficult for students to secure copies of this work, and the suggestion is made by the reviewer that a cheap reprint would be desirable.

That a single course of botany will not answer the requirements of all classes of students is forcibly shown in the appearance of Kræmer's "Botany and Pharmacognosy."* The author, who is professor of botany and pharmacognosy in the Philadelphia College of Pharmacy, has included in the book only such things as he considers it essential for the young druggist to know, and as a result, even the botanical portion differs considerably in treatment from ordinary methods. It is specially characterized by directness of statement, the elimination of irrelevant matter, and for the attention paid to the cell and cell contents. This part covers the first hundred pages. Then follows a section devoted to crude drugs in which are given the officinal names of

*A Course in Botany and Pharmacognosy, by Henry Kræmer, Ph.D. Philadelphia, 1903. 12mo. 380 pp. \$3.50.

all vegetable drugs, the name of the plants from which they are derived and the countries from which they come, a description of each drug, its constituents, allied plants from which a similar drug may be obtained, and the articles, if any, with which it is adulterated. These are arranged under such heads as seeds, roots, barks, etc., with keys for their identification. Since a large number of drugs come to market in powdered form, and therefore not easily recognizable, the author has, in the section devoted to powdered drugs, given keys and descriptions by which these may also be identified. It would doubtless be difficult for a careful student of this work to go wrong on the botanical requirements of pharmacy, and the general reader who is interested in the constituents of plants will find it a veritable mine of information. In the interests of the latter, we cannot but wish that the medicinal properties of each drug had been included, although aware that this belongs to *materia medica* rather than to pharmacy. The book admirably fills the place for which it was designed and should supplant the ordinary botanical text books in schools of pharmacy.

"Among Green Trees"[†] is, as one might surmise from the title, more of a book about trees than a manual for their identification, although this part of the subject has also received attention. The first division of the book deals with "the nature study side" as indicated by such subjects as the flight of seeds, the battle among the twigs, thorns and prickles, winter buds, etc. Following this is "the physiological side," where will be found information about how trees breathe, feed, and sleep, why they die, etc. In "the practical side" are given directions for planting and pruning trees and many other matters relating to forestry, insect pests, etc. In "the systematic side" about 125 different species of forest trees are described. The book is very well illustrated, there being twenty-five full page photographs of specimen trees and numerous illustrations in the text. The author has a clear and pleasing style, though there are occasional misstatements in the text regarding various processes of plant life.

[†]Among Green Trees, by Julia Ellen Rogers. Chicago. A. W. Mumford, 1902. 4to. 195 pp. \$3.00.

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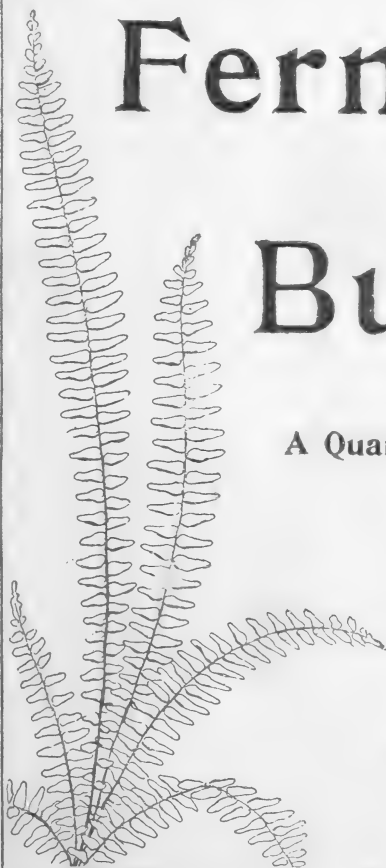
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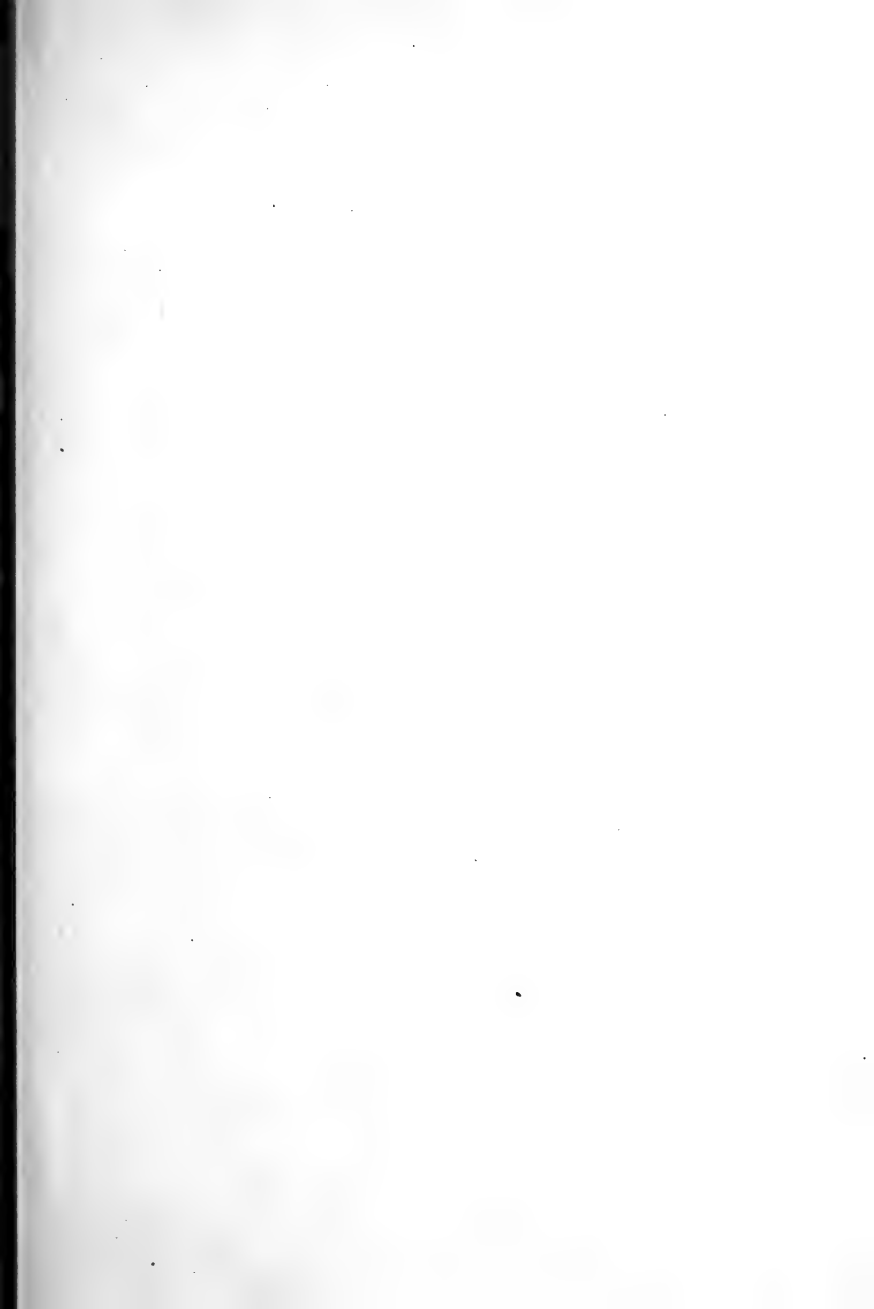
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CAMPBELL EASTER WATERS.

THE FERN BULLETIN

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THE FERN FLORA OF IOWA.

BY T. J. AND M. F. L. FITZPATRICK.

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Iowa is a great State, wedged between two grand rivers. Her surface rolls like the waves of a peaceful sea. No mountains with perpetual snows, no grand gorges, no desolate wastes are to be found within her borders. Here Nature gave birth to a beautiful land where the rewards for tillage are great.

In prehistoric periods Iowa was invaded five times by the ice from the north, but as milder weather came the ice retreated and left the surface covered with the debris of the wreck and ruin of the invasions. However, a small portion of the surface in northeastern Iowa was not covered by the ice, but stood out as a bold island in the midst of a frozen sea. This portion is called the driftless area, and being more broken and picturesque than other portions of the State, it has received the name of the Switzerland of Iowa. Along the Mississippi river, bluffs of moderate height, covered by the primeval or the younger forest and pierced by ravines of greater or less length are of frequent occurrence. In many places along the river the country rock comes to the surface in the ravines or as cliffs facing the river or its tributaries.

Beginning in northeastern Iowa, the rocks exposed in succession southward to the State line, are the Saint Croix sandstone of the Cambrian era; the Oneota limestone, the Saint Peter limestone, the Trenton limestone, the Galena limestone, the Maquoketa shales, the Upper Silurian limestone of the Silurian era; the Independence shales, the Cedar Valley limestone, the Montpelier sandstone, and the Lime Creek shales of the Devonian era, and lastly the Carboniferous formations. In northwestern Iowa the Sioux quartzite is exposed. Along the Missouri river

there occurs a remarkable succession of Loess hills. The country rock of central and southern Iowa is Carboniferous. The northern portion is covered so deeply by the drift mantle that the country rock does not or rarely comes to the surface. The topography of the State is prevailingly that of the drift period with the changes effected by subsequent erosion.

The fern flora of Iowa is not extensive. Yet, when the great uniformity of the surface features of the State are considered, the flora is all that could be reasonably expected, and probably more. The forty-seven species—thirty-one ferns and sixteen allies—enumerated below are but a mere remnant, the last successors, of a magnificent fern forest which culminated and reigned supreme in Iowa during the Carboniferous era or of the profusion of ferns to be expected during the Eocene when forests were abundant and a tropical climate prevailed, or during the Afonian, an interlude between two great ice invasions, when coniferous forests grew in plenty. Our fern flora has been destroyed and rebuilt many times ere we reach the present epoch. Each succeeding flora was made up of different species of less magnificence and in diminished numbers. At the close of the Pleistocene the fern's position in the biologic world was lowly, being few in number and small in stature. During this time the mastodon and the elephant roamed at will over our prairies and by our rivers and gathered their sustenance from our grassy savannas.

Geologic history now closes and modern Iowa comes forth with our present fauna and flora. Deciduous forests appear along our border rivers and their tributaries. The extent of the forests is moderate, the greater portion of the State being prairie. The ferns are found as mesophytic species only in the woodlands or as xerophytes in the crevices of rocky cliffs. The woodland species are diminishing in number of individuals as the forests are being displaced as a result of agricultural pursuits. The cliff species are holding their own.

Within our borders the bulk of the species is limited to the eastern half of the State; the western portion having few ferns, there being few rock exposures and only a scanty tree growth.

A study of the Iowa fern flora reveals the fact that there must have been a more extensive one in recent times. The iso-

lated localities widely separated where certain species are found within the State or of known stations within the State remote from stations known beyond our borders clearly indicate that these stations are the rearguard of a retreating flora. Iowa is also the border land where the eastern flora terminates and the western perceptibly begins. Thus situated, our State is unique, and a study of its flora is interesting.

OPHIOGLOSSACEÆ.

Botrychium Virginianum Swartz. RATTLESNAKE FERN. Rich woods. Common throughout Iowa, the individuals growing solitary.

Botrychium obliquum Muhl. GRAPE FERN. Professor Arthur reported this species from Floyd county and Professor Fink from Fayette county, under the name of *B. ternatum* Swartz.

OSMUNDACEÆ.

Osmunda claytoniana L. INTERRUPTED FERN. Rich woods. Common throughout Iowa, often growing in large colonies.

Osmunda regalis L. ROYAL FERN. Wet soil, rare. Muscatine county, *Ferdinand Reppert*.

Osmunda cinnamomca L. CINNAMON FERN. Rare. Muscatine county, *Ferdinand Reppert*; Johnson county, *Prof. Shimck*; Hardin county, *Prof. Pammel*.

POLYPODIACEÆ.

Polypodium vulgare L. POLYPODY. Rather infrequent in northeastern and eastern Iowa. The usual habitat is crevices of the limestone and sandstone cliffs. The species also occurs in central Iowa, having been found along the Iowa river in Hardin county and along the Des Moines river in Boone county.

Adiantum pedatum L. MAIDEN HAIR FERN. A very common fern in our region, occurring in rich woodland soil throughout the State.

Pteris aquilina L. BRACKEN. Dry soil in open woods, frequent in eastern Iowa and occurring in central Iowa, apparently absent in the western portion.

Cheilanthes lanuginosa Nutt. Infrequent. Found in northeastern Iowa, growing in mats on the dry faces of cliffs or in

clumps in crevices. At present it is known to occur in Winneshiek, Allamakee, Clayton, Dubuque, and Jones counties.

Pellaea atropurpurea Link. CLIFF BRAKE. WINTER BRAKE. Rather frequent in eastern Iowa, extending westward at least as far as central Iowa, occurring in crevices of cliffs.

Pellaea gracilis Hook. SLENDER CLIFF BRAKE. Known to occur in twelve counties in northeastern and eastern Iowa.

Asplenium ebeneum Ait. EBONY SPLEENWORT. Muscatine county, *Ferdinand Reppert*. A very rare Iowa fern.

Asplenium angustifolium Michx. NARROW-LEAVED SPLEENWORT. Rather rare in eastern and northeastern Iowa (Allamakee and Jackson counties). The species has also been collected in Delaware and Muscatine counties.

Asplenium thelypteroides Michx. SILVERY SPLEENWORT. A rather infrequent species, occurring in rich woods in eastern and northeastern Iowa.

Asplenium filix-femina Bernh. LADY FERN. Common throughout Iowa in rich woods. Varies greatly.

Camptosorus rhizophyllus Link. WALKING FERN. Frequent locally in pockets of limestone or sandstone cliffs in the rougher portions of the eastern half of Iowa. The type locality of the variety *intermedius* Arthur is Muscatine county.

Phegopteris hexagonoptera Fee. BROAD BEECH FERN. Rich woods, frequent locally. Known from Allamakee, Delaware, Scott, Muscatine, and Johnson counties.

Phegopteris polypodioides Fee. BEECH FERN. Woods, rare. Muscatine county, *Ferdinand Reppert*; Delaware county, *Prof. Macbride*; Hardin county, *Prof. Pammel*; Fayette county, *Miss Carr*; Allamakee county, *Miss King*.

Phegopteris dryopteris Fee. OAK FERN. Rich woods, rare. Collected in Winneshiek, Allamakee, Fayette, Johnson, and Hardin counties.

Phegopteris calcarnea Fee. Rich woods, rare. Apparently confined to northeastern Iowa. Known to occur in Winneshiek, Allamakee, Fayette, and Dubuque counties.

Nephrodium thelypteris Desv. MARSH FERN. Bogs, rather infrequent. Known to occur in nine counties of Iowa, ranging over eastern, northeastern, and central Iowa.

Nephrodium noveboracense Desv. NEW YORK FERN. This species was reported from West Union, Fayette county, by Mary E. Carr in *Linnaean Fern Bulletin*, vol. 1, No. 3, p. 6. No other Iowa collector mentions the species. The range as given by Britton and Brown in their "Illustrated Flora" is Minnesota to Arkansas, thence eastward. The species probably occurs in northeastern Iowa, from whence it was reported.

Nephrodium spinulosum Desv. WOOD FERN. Rare. Muscatine county, *Ferdinand Reppert*; Dubuque and Johnson counties, *Prof. Shimek*; Hardin county, *Prof. Pammel*; Lee county, *Prof. Arthur*.

Nephrodium cristatum Michx. CRESTED FERN. Rich woods. rare. Our specimens are from Muscatine county. *Prof. Shimek* found the species in Dubuque county.

Nephrodium marginale Michx. MARGINAL SHIELD FERN. Our specimens are from Allamakee county, collected by Ellison Orr, who writes: "Growing on a timbered, shady, steep north slope of a sandstone bluff capped by limestone, about seven miles northeast of Postville on Yellow river." The species is also common in a restricted locality near Steamboat Rock, in central Iowa.

Nephrodium goldieanum Hook. GOLDIE'S FERN. Woods, rather infrequent, Winneshiek, Allamakee, Jackson, Hardin, and Muscatine counties.

Polystichum acrostichoides Schott. CHRISTMAS FERN. Rich woods, infrequent or rare in Muscatine and Johnson counties. Reported from Jackson, Fayette, Scott, and Lee counties.

Cystopteris bulbifera Bernh. BULBIFEROUS BLADDER FERN. Frequent in calcareous soil near cliffs throughout the eastern half of Iowa.

Cystopteris fragilis Bernh. BRITTLE BLADDER FERN. Common in all the woodland regions throughout Iowa.

Onoclea sensibilis L. SENSITIVE FERN. Moist soil, woods and fields, frequent throughout the eastern half of Iowa.

Struthiopteris Germanica Willd. OSTRICH FERN. Rich woods, common in eastern Iowa, infrequent in the central and western portions.

Woodsia obtusa Torr. Calcareous cliffs, infrequent in the eastern half of the State.

Woodsia scopulina D. C. Eaton. Specimens in our collection are from Lyon county, collected by Prof. Shimek.

EQUISETACEÆ.

Equisetum arvense L. FIELD HORSETAIL. Moist soil, common throughout the State. The fruiting specimens appear in early spring, shed their spores, and soon wither away; the sterile stems flourish the summer long. No fruiting specimens were to be found during the spring of 1902, although we searched localities which furnished them innumerable during other seasons. Our belief is that the severe freeze after the season opened caused all the fertile shoots to be killed.

Equisetum pratense Ehrh. Specimens of this species were collected by Prof. Shimek in Dubuque and Clayton counties.

Equisetum sylvaticum L. WOOD HORSETAIL. Specimens in our collection are from Jasper county, collected by Prof. Norris, who writes under date of February 26, 1896: "About ten years ago I found *Equisetum sylvaticum* near here [Grinnell, Iowa]. It was extremely local and has since been exterminated by hogs."

Equisetum fluviatile L. Rather widely distributed over the northern half of the State.

Equisetum robustum A. Br. Damp soil, frequent.

Equisetum hyemale L. SCOURING RUSH. This species is probably frequent. Formerly Iowa collectors included *E. robustum* with it, hence at present there is more or less confusion.

Equisetum laevigatum A. Br. Gravelly clay soil, frequent throughout our area.

LYCOPODIACEÆ.

Lycopodium clavatum L. COMMON CLUB MOSS. Rare. The only Iowa material we have of this species was collected in Johnson county, fifteen years ago.

Lycopodium complanatum L. Our Iowa material is from Johnson county, where it is rarely collected. The species has been found in Muscatine county.

Lycopodium lucidulum Michx. Muscatine county, *Ferdinand*

Reppert; Winneshiek county, *Prof. Arthur*; Hardin county, *Prof. Pammel*.

SELAGINELLACEÆ.

Selaginella rupestris Spring. Specimens in our collection are from Dubuque, Muscatine, and Lyon counties. The species has been reported from Winneshiek and Benton counties. Dry soil; woods, cliffs; infrequent.

ISOETACEÆ.

Isoetes melanopoda J. Gay. Many years ago Dr. Vasey collected specimens of this species at Clinton, Iowa. Species of *Isoetes* are rare or absent within our limits, or else have been entirely overlooked by collectors.

MARSILIACEÆ.

Marsilia vestita Hook. & Grev. Specimens in our collection are from Lyon county, Iowa, where they were collected by Prof. Shimek. Many years ago Dr. Cousins collected this species in Iowa near the Mississippi river—so state some of the early editions of Wood's "Class Book of Botany."

SALVINIACE.

Azolla caroliniana Willd. Frequent in the sloughs and lagoons of the Mississippi river in Muscatine and Louisa counties. This species was also collected in similar situations by Charlotte M. King in Allamakee county.

Iowa City, Iowa.

FERNWORT NOTES.—III.

BY WILLARD N. CLUTE.

NEPHRODIUM UNITUM IN TEXAS. Among the pleasing results of the publication of the Fern Flora of Texas, in the April FERN BULLETIN, is the activity in fern hunting that has followed. In this, Mr. Reverchon, the author of the paper mentioned, has been a leader, and he has recently been so fortunate as to add *Nephrodium unitum* to the list of species. Hitherto, the State of Florida has been regarded as the only one in the Union in which this fern grows, and the finding of it in Texas adds greatly to its known range. The species is tropical in its distribution, but

its occurrence in Texas gives rise to the suggestion that it may yet be found in Alabama, Mississippi and Louisiana, near the Gulf. Mr. Reverchon's specimens were found in the southeastern part of his State.

LYGODIUM PALMATUM IN PENNSYLVANIA.—The climbing fern, though found in Kentucky and Tennessee, keeps for the most part to the Atlantic seaboard. Its occurrence very far inland is always noteworthy, and I take pleasure in recording a station for it in Eastern Pennsylvania, near Mauch Chunk, where it was found last year by Mr. Daniel W. Hamm.

THE RANGE OF THE TERNATE BOTRYCHIUM.—The widely distributed *Botrychium ternatum*, whose ecological forms have afforded the species-makers much employment in recent years, seems to be quite rare in Texas. Mr. Reverchon has never collected it, but in the *American Botanist*, for April, Mr. J. M. Fetherolf reports it as occasionally seen during the winter in Newton county, in Eastern Texas. The writer has seen no specimens, but the fern is so different from any other, especially in winter, when *B. Virginianum* is absent, that it is doubtless correctly identified. The species has been found in Louisiana and is likely to occur in various places in Eastern Texas, where the soil and climate are similar. Dr. Underwood has recently described a southern form as *B. tenuifolium*, basing it upon specimens from Louisiana, Florida, Alabama and Missouri, and to this the Texas specimens are doubtless to be referred.

A. PTERIS FREAK.—Mrs. A. T. Perry has recently sent me pinnæ from a frond of *Pteris aquilina*, which is curiously divided and subdivided until it is several times pinnate. This form is not infrequently met with where *Pteris* is common, but what makes the present specimens interesting, is the fact that the under surface is covered with a fungus that forms narrow, black parallel lines, which might be easily mistaken for the fruiting parts of an *asplenium*. This fungus is known as *Dothidea filicina*, and it would be interesting to know if its presence on the frond is responsible for the increased division of the pinnules..

MENISCIUM RETICULATUM IN FLORIDA.—Mr. James H. Ferris has added another genus to the fern flora of the United States

by locating *Meniscium reticulatum* in Florida. Some time ago he sent me, for identification, a single pair of fertile pinnæ of this species under the impression that they belonged to some species of *Acrostichum*. *Meniscium reticulatum*, however, is so distinct in its manner of fruiting that there is no hesitation in referring these pinnæ to it. Since *M. reticulatum* is only known to be native in Mexico, West Indies and southward to Peru, there seemed a possibility that the pinnæ might have come from a cultivated specimen or at least from a plant escaped from cultivation, but Mr. Ferris informs me that the collector says the fern grows wild somewhere in the everglades. We shall endeavor to secure further specimens and information and to definitely locate the plants, if possible.

THE GENUS *EQUISETUM* IN NORTH AMERICA.

By A. A. EATON.

FOURTEENTH PAPER.

E. HIEMALE L.

Stems single or cespitose, persisting 3 or 4 years, 3 inches to 8 feet high, 1 to 8 lines thick, with 6 to 40 angles, beset with many cross-bands or 2-rowed tubercles of silex. Grooves narrow, bearing a single row of stomata on each side, usually beset with cross-bands of silex, rarely with rosulæ, often covered with a thick coating of silex, which renders the stems smoother in age; sheaths of various form and structure, oftenest with a black base and top, separated by a broad or narrow ashy band, recurving and splitting in age, finally deciduous in sections; teeth long and flexuous, cohering into one or several groups by means of small unicellular bristles at the tip, narrowly white bordered, articulated to the sheaths and torn off by the growth of the stem, or soon deciduous or in some varieties persistent, flexuous or rigid; spikes oval, green or blackish, ending in a firm point formed of abortive sporophylls. Central cavity three-quarters the diameter of the stem, the vallicular small, vertically oval, the carinal usually present. Carinal base broad at the surface, narrowed and extended within nearly or quite to

the carinal hole, the vallecular being comparatively weak, not reaching the vallecular hole, the green parenchyma forming an oblong mass above the central hole and between the contiguous carinal bast-masses.

A particularly variable species or group of forms of different aspect exteriorly, but separated from the former group by having the teeth articulated to the sheaths, not leaving a persistent base in falling, and especially in the arrangement of the bast as previously mentioned. The type is European and is characterized by two rows of tubercles on the ridges and by long amplified sheaths as in *laevigatum*. I have seen nothing from America to match it, and all our forms so referred really belong to *robustum*. After comparing a large series of American and European plants I have concluded that the latter species is not specifically distinct. According to the author, its characters are the shorter sheaths, larger size, and cross-bands of silex rather than two rows of tubercles, but the variety *affine* has the size and sheaths of European *hiemale*, differing by having bands of silex on the angles. The variety *pumilum* is smaller than most of my specimens of variety *viride*, smaller than some forms of *variegatum*, yet has the bands of *robustum*. Variety *Californicum* has the sheaths and appearance of *robustum*, is often larger than that form, and has two rows of tubercles and leaves centrally grooved. The European *Moorei* with large amplified sheaths has its counterpart in var. *intermedium*, only the latter has bands while the former has usually two rows of tubercles. Finally, the bands on which the species mainly rests are not constant in our species nor are the tubercles in the European. Of the latter Milde, who regarded *robustum* as a sub-species, quotes specimens with cross-bands from several European localities, while var. *Moorei* not rarely shows them. Var. *intermedium* and some others occasionally show tubercles and leaves centrally grooved, while branches of any of the group bear grooved leaves as a rule. Variety *Californicum* often bears bands as well as tubercles, and typical *robustum* not rarely bears a few tubercles.

Although typical *robustum* differs markedly from typical *hiemale* it will be seen from the above that not one character is

diagnostic, and nothing seems reasonable but to make it a subspecies of *hiemale*.

In one form or another this species is found around the world in the North Temperate regions, ranging from Mexico, 20 degrees north, to the Arctic Circle.

KEY TO THE VARIETIES.

I. Ridges with bands of silex—ROBUSTA.

A. Sheaths long, green, amplified.

Stems stout, 1 to 4 feet, 1 to 4 lines in diameter. *intermedium*

Stems slender, 1 foot high. *Texanum*

Stems weak and herbaceous, 3 to 12 inches high, $\frac{1}{2}$ to 1 line in diameter. *herbaceum*

B. Sheaths tight, mostly with black and white rings.

Stems 3 to 15 inches tall, sheaths fuscous, teeth persistent, lower joints tumid. *pumilum*

Stems with spiciferous branches, grooves with rosulæ.

. *Suksdorfii*

Stems 3 feet high, stomata in 1 to 3 rows. *Drummondii*

Stems 1 to 3 feet high, sheaths longer than broad, teeth often carried upon the apex of the stem as a pagoda-like termination. Appearance of *hiemale*, character of *robustum*. *affine*

Sheaths as broad as long, teeth more persistent, stems 3 to 6 feet high. *robustum*

II. Ridges with two rows of tubercles—HIEMALIA.

A. Without rosulæ in grooves. European. *hiemale*

B. With rosulæ in the grooves.

Stout, teeth deciduous. *Californicum*

Smaller, teeth rigid, persistent. *Doellii*

CAMPBELL EASTER WATERS.

The botanist whose portrait appears in this number is well known to the members of the Fern Chapter as the second president of the Chapter, and as a constant contributor to the pages of the BULLETIN. He is a native of Baltimore county, Maryland, where he was born September 14, 1872. He graduated at Johns Hopkins University in 1895, having been "Hopkins Scholar"

three times, and receiving a "University Scholarship" at graduation. He then took post-graduate work in chemistry, mineralogy, and botany, devoting himself more especially to chemistry, in which two years later he became lecture assistant at the University. He received the degree of Ph. D. in 1899. In 1900 he went to Connecticut and acted as professor of chemistry and physics in the Agricultural College of that State for one year. He then returned to Baltimore, and has since been assistant in chemistry at Johns Hopkins, and assistant editor of the *American Chemical Journal*. He is a member of the American and German Chemical Societies, and of the American Association for the Advancement of Science.

What Dr. Waters has done in botany, however, will be of greater interest to most of our readers. In 1893 he was one of the charter members of the Linnæan Fern Chapter. In 1895 he was elected secretary of the Chapter, in which capacity he served during the following year. In 1896 he was chosen president of the Chapter and retained that office during 1897-8. He is on the executive committee of the Botany Club of Baltimore, and a member of the Naturalists' Field Club of that city. He is one of the managers of the Wild Flower Preservation Society of America, and the president of the Baltimore Chapter. He is also a member of the Botanical Club of the A. A. A. S., and of the Biological Society of Washington. These facts show that he is deeply interested in botany, while his numerous articles in the FERN BULLETIN show that he is especially attracted to the ferns, and is a close observer of their growth and structure. No one but a very patient and painstaking student could have elaborated the "Analytical Key for the Ferns of the Northeastern States, Based on the Stipes," which he published last summer. He has also made some photographs of fern structure, greatly enlarged, which show the indusia, buds, and other parts as they actually are, and not as they may appear to the imagination of an artist. His book, "Ferns," which will soon appear, will contain these and the "key" as special features.

For a young man Dr. Waters has certainly accomplished a deal of work, and made an honorable name for himself both in chemistry and botany, and his career still lies before him.—
B. D. Gilbert.

ASPLENIUM MUTICUM.

BY B. D. GILBERT.

This new species, which was first published in *The American Botanist* for May, occurs in Middle Florida, the State which contains so many ferns that are found nowhere else in the United States. My attention was called to it by the mention made of it in *The Torrey Bulletin* for April, 1879, by Prof. D. C. Eaton. In one of his papers on "New and Little Known Ferns of the United States," he spoke of a fine lot of specimens sent to him from Ocala, Fla., by Capt. J. Donnell Smith. "With these," he said, "are a few specimens of *A. Trichomanes*, with large, oblong pinnæ, much as in specimens from Bermuda and Tropical America." I had collected the fern in Bermuda in 1898, long before I noticed this reference to it, and although Governor Lefroy, in his "Botany of Bermuda," listed it as *A. Trichomanes*, I saw that it could not be the usual form of that species; and in my "Revision of the Bermuda Ferns," I adopted Sir William Hooker's view and published it as *A. Trichomanes* var. *majus* Mett. When I chanced upon Professor Eaton's statement, however, I was not satisfied with Hooker's determination. I then thought it might be *A. Anceps* Solander, as the scarious edges are quite noticeable in the Bermuda specimens. But I had not yet seen any of the Florida specimens. A request sent to Captain Smith that he would loan me his examples of *A. Trichomanes* from Florida, brought the statement that he did not remember having obtained any in that State or having sent any to Professor Eaton. So the matter was left in abeyance until I could go to Florida and procure it myself. Last spring, being in St. Augustine, I ran down to Ocala and spent three days there for the express purpose of gathering this species. I found it growing on limestone rocks, sometimes on an outcrop of the roadside, but more often at what are called "sink holes." The finest growth was at one of these pools, about three miles from Ocala, deep in the woods and away from any traveled road. I was taken to this spot by a negro called "July" Brown, who was familiar with the woods and had hunted 'possum in them hundreds of nights. The water lay at the foot of a slope which rose quite suddenly behind

it. On the side toward the rise of ground there was a ledge of rock which rose about twenty feet above the pool. This ledge was not perpendicular, but sloped inward from the upper edge and thus overhung the pool, making it difficult to gather anything from it except where the plants grew on the overhanging edge. The ledge was perhaps forty of fifty feet long, and plenty of the fern grew in the crevices, but not much of it was obtainable without a boat. It was very thrifty and of fairly good size, but none of it was as large as some of my Bermuda specimens.

Let me point out briefly some of the distinctions between *A. muticum* and its allies. From *A. Trichomanes* it is easy to distinguish it at once by the shape of its pinnæ. In *A. Trichomanes* the pinnæ are always cuneate-based and centrally attached: in *A. muticum* they are broadly oblong and attached to the rachis at the lower side of the truncate base. The alliance with *A. parvulum* is closer, but there is no difficulty in distinguishing between them. *A. parvulum*, as known in the Eastern States, has long, narrow, somewhat tapering pinnæ, which on the upper two-thirds of frond are exactly opposite each other and are more or less auricled on the upper side at base. The lower pinnæ are much reduced in size, deltoid, and more or less reflexed. The edges also are *always entire*. As opposed to this, *A. muticum* has oblong, blunt edged pinnæ which are *always crenate* on the upper and outer edges and seldom possess more than a suspicion of an auricle.

In Hooker's Species Filicum, *Asplenium parvulum*, M. & G., and *A. resiliens* Kze. are placed under *A. ebenneum* Ait. as "Var. minus." There is some question whether these two ferns are the same, as Hooker seems to indicate. The figure published by Martens & Galeotti would do very well for our eastern form, but neither in size, shape of pinnæ or situation of sori does it accord with the so-called *parvulum* of Jamaica or of Arizona. The latter have the pinnæ generally retrorse, and the sori, instead of being situated close to the costæ, are numerous and lie close to the edges, leaving a space between the two rows. This is a feature which Mr. G. S. Jenman notices in his description of *A. parvulum*, but there is nothing to indicate that he knows *A. resiliens*. Prof. Eaton notes under *A. parvulum* that "Specimens

from Chiapas have all the pinnæ deflexed." That is the case with Prof. J. G. Lemmon's specimens from the Huachuca Mts., Ariz. I have not seen either Kunze's description or his specimens, but am inclined to believe that we have two species in the United States, viz., *A. resiliens* Kze., in the west, and *A. parvulum* M. & G., in the east.

THE FERN FLORA OF WASHINGTON.

BY J. B. FLETT.

The State of Washington has not been as thoroughly explored as have the older States in the East. Much has been done, but much remains to be done. This is especially true in the mountain region, where vast areas still await the advent of the botanical explorer. No complete list of ferns and their allies of this State can be made for many years to come, until the hidden recesses of mountain, lake, and canon have been thoroughly explored and their secrets revealed.

This State has a great diversity of soil and climate. It may be divided into three topographical regions. The climate of each being modified by local conditions. Western Washington, or that region lying west of the Cascade Mountains, has an average rainfall of about 65½ inches. The northwestern part is traversed by the Olympic Mountains, on whose western slopes there is an average rainfall of about 92 inches. Here the ferns grow luxuriantly in the mossy woods, the species most abundant and conspicuous being the following: Maiden hair, sword fern, deer fern, brake, western polypody or licorice fern (*P. falcatum*), spreading wood fern and *Athyrium cyclosorum* with its varieties, especially *latifolium*. On the storm-swept peaks at an altitude of about 5,000-6,000 feet are the following: The holly fern, mountain polypody (*P. hesperium*), dwarf spleenwort, fragile fern (*Cystopteris fragilis*), mountain lace fern (*Cheilanthes gracillima*) and parsley fern, or pea fern, as it is popularly called with us, from its peculiar manner of fruiting.

In the Puget Sound basin lying between the two mountain regions may be found all the ferns mentioned as conspicuous west of the Olympic range, to which must be added *Woodwardia*

radicans Sm. and *Cystopteris fragilis*. The latter was seen in only one station near sea-level, growing on the banks of a gravelly lake about the roots of oak trees, though common enough in the mountains. On Fidalgo Island, at no greater altitude than 800 feet, grew *Pellaea densa*, golden fern (*Gymnogramma triangularis*) and parsley fern. These are also said to grow on the San Juan Islands, not far distant. This region has much less rain than the average for western Washington and the soil is poor and rocky. This latter fact accounts for the presence of ferns usually confined to the higher mountains.

The high peaks of the Cascade Mountains are quite similar to those of the Olympic Mountains as far as the fern flora is concerned. *Pellaea densa*, golden fern, green spleenwort, *Polystichum Mohroides*, *P. Californicum*, *P. aculeatum* and *Nephrodium montanum* must be added to those mentioned for the higher peaks of the Olympics. Doubtless some of the above will yet be found in the Olympics.

Eastern Washington has an average rainfall of about 14 inches. The Blue Mountains cut across the southeastern corner, while the northern part is generally mountainous. Here again we have a variety of ecological conditions. The country is more open and dry and has more sunshine than the western part, hence the ferns do not flourish as luxuriantly. Many species of western Washington are also found here in favorable situations, and some not found west of the Cascades occur, among which are *Woodsia Oregona*, *W. scopulina* and *Cheilanthes lanuginosa*. The fern flora of the mountains in the northeastern part is similar to that of the mountains already mentioned. Doubtless, less is known of this region than any other part of the State.

There is a transition area in passing from the lowlands of western Washington to the mountains in which the oak fern is very abundant and also very beautiful, not having that rusty appearance which often mars its beauty in the East. Here also are the haunts of several of the *Botrychia* and the *Lycopodiums*. *L. clavatum* is very abundant and is brought to this city about Christmas time and sold for decorative purposes. No society is needed for its protection here, for the supply is ample.

The present list includes thirty-four ferns and thirty allies. The writer will be glad to receive any additions or corrections to this list.

OPHIOGLOSSACEÆ.

Ophioglossum vulgatum L. ADDER'S-TONGUE. Reported from the southern part of the State by Suksdorf.

Botrychium occidentale Underw. Moist places near streams and in alluvial meadows. Not very common. Spanaway, Puget Sound region. It extends northward into Alaska. Collected by the writer on Prince of Wales Island.

Botrychium Virginianum Sw. RATTLESNAKE FERN. Lake Cushman, Puyallup, *H. H. Garretson*; also reported by Suksdorf. Not common.

Botrychium lanceolatum Angs. Rare, rich mossy woods. Foothills of Mt. Tacoma.

Botrychium matricariaefolium A. Br. Reported by Suksdorf.

Botrychium simplex Hitchcock. Olympic Mountains, *Piper & Elmer*; Mt. Tacoma, *C. E. Smith* (?).

POLYPODIACEÆ.

Polypodium hesperium Maxon. COMMON MOUNTAIN POLYPODY. Found in crevices of rocks at an altitude of 5,000-6,000 feet. It is not found near sea-level.

Polypodium falcatum Kellogg. This is our common Polypody or licorice fern, which generally grows on rotten logs and tree trunks in dense, shady woods, though sometimes rooting in soil. It grows long and slender with acute pinnæ in densely shaded places, while in open places it becomes thicker and the pinnæ more rounded and smaller.

Polypodium Scouleri Hook. & Grev. Gray's Harbor, *Piper*. Not widely distributed, confined to the coast.

Gymnogramma triangularis Kaulf. GOLDEN FERN. Eatonville, San Juan Islands, Fidalgo Island, foothills of Mt. Tacoma. *O. D. Allen*; Columbia river.

Adiantum pedatum L. MAIDEN-HAIR FERN. Our form is larger and more clustered than the eastern form. The variety *rangiferinum* was seen by the writer near Mt. Baker on an exposed rock-slide at an altitude of about 5,000 feet. Good speci-

mens of the variety were collected along the rocky shores of southeastern Alaska near Ketchikan.

Pteris aquilina lanuginosa Hook. WESTERN BRAKE. This grows very large in partially shaded places and extends northward into Alaska. Seen on Cleveland Peninsula.

Cheilanthes gracillima D. C. Eat. MOUNTAIN LACE FERN. Not uncommon in the mountains, where it grows in dense tufts in the crevices of rocks reaching a high altitude.

Cheilanthes lanuginosa Nutt. Near the eastern boundary line, Piper.

Cryptogramma acrostichoides R. Br. PEA FERN, PARSLEY FERN. Common in the mountains, Eatonville, Fidalgo Island.

Pellaea occidentalis Rydberg. This closely resembles *P. atropurpurea*. It occurs in the southern part of the State along the Columbia river.

Pellaea densa Hook. Cascade Mountains, Fidalgo Island, crevices of rocks.

Lomaria spicant L. DEER FERN. Common. The variety *ser-ratum* is found in deep, shady gulches.

Woodwardia radicans Sm. Shore of Puget Sound, not very abundant. This is probably near its northern limit.

Asplenium trichomanes L. DWARF SPLEENWORT. Cascade Mountains, Olympic Mountains, not very common.

Asplenium viride Huds. GREEN SPLEENWORT. Cascade Mountains, near the northern boundary line, southeast of Mt. Tacoma. Rare.

Athyrium filix-femina Roth. LADY FERN. There are several varieties of this variable species.

Athyrium cyclosorum Rupr. Common in deep ravines and at the base of mountains. Several varieties.

Phegopteris polypodioides Fee. BEECH FERN. Columbia river, not widely distributed.

Phegopteris alpestris Nutt. Common in rock-slides in alpine regions. Altitude, 5,000-6,000 feet.

Phegopteris dryopteris Fee. OAK FERN. Common. Our form is often known as *P. Robertiana*.

Nephrodium oreopteris Desv. Rare. Found by Mr. Elmer on

Mt. Stewart. This is the only locality on record in the United States. It is not rare on the mountains of southeastern Alaska.

Nephrodium spinulosum dilatatum Baker. SPREADING WOOD FERN. Quite common in rich woods near sea-level, not extending very high on the mountains.

N. filix-mas Schott. Reported by Suksdorf from the southern part of the State.

Polystichum munitum Presl. Very common.

Polystichum munitum inciso-serratum D. C. Eat. Common.

Polystichum munitum imbricans Maxon. Not common, Wind river, Skamania Co. This is quite different from the type which grows with it, and may be raised to specific rank when better known.

Polystichum lonchitis Roth. HOLLY FERN. Common in the mountains in crevices of rocky ledges. This fern extends far into alpine regions, where finely fruited diminutive plants are seen.

Polystichum aculeatum Californicum Underw. Eatonville, Mt. Stewart, Mt. Adams, not common, crevices of rocks. There is no sharp line of demarcation between this and the following varieties:

Polystichum aculeatum scopulinum Gilbert. Not uncommon. Smaller and less deeply incised than the preceding species.

Polystichum aculeatum lobatum Roth. Mt. Tacoma. Rare.

Polystichum mohroides. Rare. Mt. Stewart, Sandberg & Leiber, Elmer; Horse Shoe Basin, Okanogan Co., Elmer.

Cystopteris fragilis Bernh. FRAGILE FERN. Common in the mountains, probably reaching a higher altitude than any other fern, with *Cheilanthes gracillima* as a close competitor.

Woodsia scopulina D. C. Eat. Rather common east of the mountains. Mt. Stewart, Elmer; Skamania Co. mountains.

Woodsia Oregana D. C. Eat. With the preceding.

MARSILIACEÆ.

Marsilia vestita Hook & Grev. Reported from the southeastern part of the State, Piper and Suksdorf.

Azolla Caroliniana Wild. WATER FERN. Reported by Suksdorf.

EQUISETACEÆ.

Equisetum arvense L. FIELD HORSETAIL. Very common. An alpine form of this species is quite common near snow-line.

Equisetum hiemale L. SCOURING RUSH. Common. Several varieties are reported by Mr. Eaton from Suksdorf's collection.

Equisetum robustum A. Br. Common.

Equisetum fluviatile L. Trout Lake.

Equisetum fluviatile limosum Gilbert. Pools and ditches. Longmire's Springs and Paradise Valley.

Equisetum laevigatum A. Br. Reported from the southern part of the State by Suksdorf.

Equisetum littorale Kuhlén. Southern part of the State, Suksdorf.

Equisetum palustre L. Common in swamps and sluggish streams. The variety *fallax* is common.

Equisetum Telmateia var. *Braunii*. Common, extending northward into Alaska. Cleveland Peninsula.

Equisetum variegatum Alaskanum A. A. Eaton. Reported by Suksdorf from the southern part of the State near the Columbia river.

LYCOPODIACEÆ.

Lycopodium selago L. Cascade and Olympic Mountains. This species is quite variable. A large form intermediate between this and *L. lucidulum* has recently been named *L. lucidulum f. occidentale* by the editor in the January BULLETIN. This grows in dense coniferous woods about the base of Mt. Tacoma. It is possible that it may be made a distinct species when better understood. It seems to be quite abundant in a limited area.

Lycopodium inundatum L. Quite abundant at Spanaway Lake, near Tacoma, though not seen by the writer elsewhere. Alluvial meadows.

Lycopodium annotinum L. Not very abundant. Foothills of Mt. Tacoma; also reported from the southern part of the State.

Lycopodium clavatum L. COMMON CLUB MOSS. Common in the dense forest between the Cascade Mountains and Puget Sound.

Lycopodium Sitchense Rupr. Common among heather about the foothills of Mt. Tacoma. Altitude 5,000 feet.

Lycopodium alpinum L. Reported by Suksdorf from the southern part of the State.

SELAGINELLACEÆ.

Selaginella rupestris Spring. Very abundant on Fidalgo Island and the adjacent island, Mt. Erie. This form has recently been named *S. Columbiana*.

Selaginella densa Ryd. Very abundant on the mountains along Wind River, Skamania Co.

Selaginella Oregana D. C. Eat. Gray's Harbor, *Piper*; Sardine Mountain, Eatonville.

ISOETACEÆ.

Isoetes echinospora braunii Engelm. Alpine lakes at base of Mt. Tacoma. Altitude 5,000 feet.

Isoetes echinospora Fletti A. A. E. Spanaway Lake. Previously collected by John Allen.

Isoetes Bolanderi Engelm. Reported from the southern part of the State.

Isoetes Nuttallii A. Br. Reported by Suksdorf.

Isoetes Howellii Engelm. Klickitat and Spokane counties. Suksdorf.

Isoetes minima A. A. Eaton. Spokane Co., Suksdorf.

Isoetes paupercula A. A. Eaton. Five-mile Lake.

Isoetes Piperi A. A. Eaton. Green Lake, near Seattle.

Tacoma, Wash.

DEATH OF MISS SADIE F. PRICE.

Just as this issue is going to press, we are apprised of the death of Miss Sadie F. Price, which occurred at her home in Bowling Green, Ky., July 3, 1903.

Miss Price was born in Bowling Green, where she has always resided. She was the daughter of Alexander and Maria M. Price and sister of Miss Mary E. Price, her only living relative. She was a talented and intellectual woman, an artist of ability, author of "The Fern Collectors' Handbook," and the

discoverer of several new species of plants, which have been named in her honor. For some time she has been teaching nature study classes in her native city. Her interest in natural history has made her known to a large number of correspondents, who will hear of her death with regret.

CAN SCOLOPENDRIUM LINDENI, HOOK. BE SEPARATED FROM S. VULGARE SM.?

BY DR. H. CHRIST.

Dans un travail très intéressant qui a le but de préciser les localités Américaines de *Scolopendrium vulgare* Smith, Mons. William R. Maxon* parle (p. 42) d'une plante du Mexique Prov. de Chiapas qui a été identifiée par erreur au *S. vulgare*, et qui en serait "clearly distinct." Il s'agit du *S. Lindenii* établi par Hooker Icon., New Ser. I (or Vol. 5 of the entire work), Tab. 484, Ann. 1841, avec figure. Cette plante a été trouvée par Linden (Herb. Mex. 1543), à Chamulares (ou Chamalas? Hooker écrit Chamulars), Prov. de Chiapas.

Dans ses Spec. Filic. IV, 2 Ann 1862, Hooker abandonne cette espèce et la réduit comme simple synonyme au *Scol vulgare*, en ajoutant "a small form is in my herbarium from Chiapas, Mexico, Linden." Comme Mr. Maxon nous apprend (p. 42), la même réduction a été faite par Prof. Eaton (Ferns N. Am. 247, Ann. 1879), des échantillons de Chiapas, trouvés par le voyageur, A. Ghiesbreght. J'ai eu la chance de recevoir la même plante, collectée en 1901 dans les environs de S. Cristobal, Prov. de Chiapas, par Mr. German Wrunch, et me permets d'en dire ici mon opinion. Constantons d'abord qu'elle est absolument identique à la figure donnée par Hooker dans ses Icones. La ressemblance est parfaite pour les dimensions et pour le part particulier.

C'est une plante petite et en même temps abondamment fructifère; la longueur des stipes est de 3 à 4 cent., celle des frondes de 13 à 15 cent., et la largeur de 2 cent., et je compte jusqu'à 35 sores de chaque côté de la costa. Outre la petitesse inusitée de la feuille, il y a deux autres particularités: la fronde

* "On the Occurrence of the Hart's-tongue in America," in Fernwort Papers. Linn. Fern Chapter, Dec. 30, 1900, p. 30.

est très-longuement atténuée vers la pointe, et les écailles qui couvrent le stipe et le bas de la costa sont relativement très-longues et très-nombreuses.

Mais à part ces petites particularités, il est impossible de découvrir le moindre caractère qui nous autoriserait d'admettre une différence spécifique ou même une variété bien établie. Tout: le tissu, les nervures, les sores, l'indusie, la forme des écailles est incontestablement identique avec *S. vulgare*, et la plante du Chiapas, conformément au climat chaud et relativement sec de cette province, offre en conséquence un aspect un peu plus xerothermique et plus réduit que le gros du *S. vulgare* de nos pays tempérés.

En outre, il est facile de trouver, parmi les échantillons de nos contrées, des frondes qui offrent à peu près la même forme étroite, à pointe allongée. C'est ce qu'on appelle quelquefois var. *angustifolium*. J'en ai dans ma collection par ex. du val Solda, Lac de Lugano, Italie, Nov., 1899, l. Christ et de Brusiumpiccolo, Lac de Lugano, Juill. 11, 1901, l. Rosenstock. Ces échantillons diffèrent de la plante de Chiapas très-peu. Ils ont les sores un peu moins serrés et des écailles du stipe moins nombreuses, voilà tout.

Dans l'impossibilité d'établir, pour le plante de Chiapas, une diagnose différencielle suffisante pour la séparer de *S. vulgare*, dans l'impossibilité de lui attribuer des caractères d'une variété distincte, il faudra admettre que c'est une forme un peu réduite, un peu xerophile de la Langue de Cerf commune, et de suivre l'opinion de Hooker et d'Eaton à cet égard.

Cela ne diminue en rien l'intérêt d'une station aussi méridionale comme le Chiapas, et en même temps aussi isolée de l'aire générale de l'espèce.

Dans l'hémisphère oriental, les stations les plus méridionales de mon herbier sont celles-ci:

Madeira, l. Moriz; Madeira, Ribero dos Socorridos, 500 m., l. R. Fritz, 1880; Gorges de la Chiffa, Atlas de Blidah avec *S. Hemionitis*, Jano, 1888, l. Christ; Amanus, Syria, 1899, l. Mrs. Shepard.

Bâle.

TWO NEW VARIETIES OF THE TERNATE BOTRYCHUM.

BY B. D. GILBERT.

In October, 1901, Dr. J. V. Haberer, of Utica, N. Y., collected a form of *Botrychium*, which was at once recognized as peculiar and striking. It was found on a bluff west of Whitesboro, Oneida county, N. Y., in thin woods or under a thick stand of *Pteris*. In October, 1902, both Dr. Haberer and myself collected it again at the same place, taking only the fronds and leaving the roots to bear plants another year. This bluff or side hill facing the north extends along the south side of the Mohawk river for several miles, from Whitesboro to Oriskany, and we found on examining Dr. Haberer's collections for 1901 that he had also gathered it on the same bluff near Oriskany; while in October, 1900, he found the same form at Cascade Glen, south of Utica, although the specimens were not quite so large. In its full estate it is the largest form known east of the Mississippi, and is fairly uniform in size. There is little doubt that this is the var. *australe* of Prof. Eaton, which he mistakably identified with Robert Brown's *B. australe* from Australia and New Zealand, and with *B. decompositum* M. & G., from Mexico, both of which are quite different plants. It must, therefore, take a new name, and with Dr. Haberer's consent I have named it after him.

BOTRYCHUM OBLIQUUM HABERERI var. nov. Rootstock short, thick, with several heavy corrugated roots branching from it; bud pilose; common stipe 3-5 cm. long; stipe of leaf 6-8 cm. long, stipe of fertile panicle 15-26 cm. long, total height of plants 30-45 cm.; number of vascular bundles—1 in stipe of panicle, 2 in stipe of leaf; panicle always tripinnate, heavy, 10-18 cm. long, branches growing upright; leaf broader than long, measuring 10x15, 11x18, 14x22, 15x26 and 16x20 cm., tripinnate, nearly always 6 pairs of pinnæ and in bud these are distinctly countable; lowest pair twice divided to costæ, largest pinnules with 6 pairs of segments rather deeper on lower side and in larger specimens 5-6 cm. long, $2\frac{1}{2}$ cm. wide; lower segments broadly attached to midrib 1 cm. from next above, and with distinct midvein run-

ning two-thirds of way to end, from which numerous veins branch flabellately to edge; segments ovate heart-shaped, set at an angle to costa and somewhat decurrent upon it, obtuse or somewhat acute, edges entire or obscurely toothed; general outline of spores bluntly triangular, occasionally round or crescent-shaped; texture moderately thin but varying somewhat with shade or location.

In general it can hardly be claimed that our eastern *Botrychia* are handsome plants, the exception being fine specimens of var. *dissectum*; but the species now under consideration will certainly rank among our most beautiful ferns. This variety does not fruit so freely as *obliquum* proper. Out of ten specimens gathered in 1902 only three were fruited. In some cases the next year's bud has broken out of its sheath and cast away its hairy envelop or covering.

Localities: Side hill facing north, Whitesboro and Oriskany, N. Y., *Dr. J. V. Haberer*. Also Cascade Glen, south of Utica. Ravine near Ilion, N. Y., *B. D. Gilbert*. Shandaken, Catskill Mts., *Mary F. Miller*, in herb. *Gilbert*.

BOTRYCHIUM OBLIQUUM ELONGATUM var. nov. *Gilbert & Haberer*. This variety is easily recognized by one who has made any study of the *Botrychia*. It is generally of medium size, has long narrow pinnules with rounded, or barely acute, closely placed segments that are finely serrate as in *ternatum* proper, the pinnæ generally acute. The lowest pair of pinnæ are twice pinnate, the lowest segments on the inferior side being much the longest, or one-half the length of the pinnule itself. This is sometimes true also of the second pair of pinnæ. The rest of the pinnule is only pinnatifid with rounded segments, as are also the upper pinnæ. The effect of this large segment on the lower pinnule is almost like that of an auricle, except that it is generally fully separated from the rest of the pinnule; and it renders the variety very easy to be recognized.

Localities: In pasture on edge of woods, Ilion, N. Y., *B. D. Gilbert*; Cascade Glen, near Utica, *J. V. Haberer*. Berry field, Clayville, N. Y., *B. D. Gilbert*.

A SINGULAR VIEW

A number of species were referred to this species [*Botrychium ternatum*] as varieties by Milde, and the practice is still followed by some of his modern admirers. There seems to be no difference of opinion relative to the existence of the groups of individuals as distinct groups, the only difference appearing to be the rank that shall be assigned them. The *ternatum* group represents a closely allied group of forms that appear to have become widely scattered from some common centre. There is no rational doubt but that they have had a common origin; this, of course, is the only possible explanation of their structural and habital relationship. Now, where was the original centre from which they sprung? According to the system that would make them all varieties of *B. ternatum* because that species *happened* to be the first described, it would seem to follow that that centre was Japan, otherwise they could not be varieties of a Japanese species. The current system of naming varieties is a stupid practice handed down to us from the past, and is wholly at variance with the modern conception of evolution. The original centre, in all probability, was *not* in Japan, so that the members of the *ternatum* group are not varieties sprung from *B. ternatum*, and it creates a false impression to call them so. They are distinct *things*, as everyone admits, and we maintain it is more rational and more in accord with our conceptions of evolutionary origin from a common stock to call them species. It is also much simpler and leaves us free to determine the original centre of distribution and relationship without prejudice. The practice of naming varieties on slight environmental characters ought to cease, and botanists should discourage the naming of such trivialities. A marked example of how far this reduction of species to varieties can be carried is seen in Dr. Christ's reduction of *Dryopteris Marginalis* and *D. Goldiana* to varieties of *D. filix-mas*. For a European who has never seen either of the species growing in its native habitat to take such liberties with American species is, to say the least, violating the code of international courtesy, and ought to stand as a warning to those who still hold to the ancient heresy that Europeans know more about the American flora than we do ourselves.—Prof. L. M. Underwood in *Torrey Bulletin*.

INDEX TO CURRENT LITERATURE RELATING TO FERNS.

Readers are requested to call our attention to any omissions from this list.

BRITTON, E. G. *The Jenman Collection of Ferns*. Journal of the New York Botanical Garden, My. 1903.

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CLUTE, W. N. *Fernwort Notes.—II*. Fern Bulletin, Ap. 1903.

CLUTE, W. N. *List of Fernworts Collected in Jamaica*. Fern Bulletin, Ap. 1903.

DOBBINS, F. *Lycopodiums of the Green Mountains*. American Botanist, My. 1903.

DRUERY, C. T. *New Forms of Ferns*. Fern Bulletin, Ap. 1903.

EATON, A. A. *Raising Nephrolepis from Spores*. Fern Bulletin, Ap. 1903.

EATON, A. A. *The Genus Equisetum in North America*. Thirteenth paper. Fern Bulletin, Ap. 1903.

FETHEROLF, J. M. *Among Texas Ferns*. American Botanist, Ap. 1903.

GILBERT, B. D. *A New Fern From Bermuda*. American Botanist, My. 1903.

HARPER, R. M. *Lycopodium cernuum in Georgia*. Torrey, Je. 1903.

MAXON, W. R. *Notes on American Ferns.—VI*. Fern Bulletin, Ap. 1903.

OSMUN, A. V. *Equisetum scirpoides in Connecticut*. Fern Bulletin, Ap. 1903.

REVERCHON, J. *The Fern Flora of Texas*. Fern Bulletin, Ap. 1903.

UNDERWOOD, L. M. *An Index to the Described Species of Botrychium*. Illust. Torrey Bulletin, Ja. 1903.

UNDERWOOD, L. M. *American Ferns.—V. A Review of the Genus Danaea*. Torrey Bulletin, D. 1902.

——— *Tea-leaf Fern*. American Botanist, My. 1903.

EDITORIAL.

It is a rare thing for the owner of a publication to deliberately invite competition, but the editor of the *FERN BULLETIN* is about to do this very thing by suggesting that it would be excellent for fern study if other parts of the world had journals to represent it. A small publication covering Great Britain and the continent, another in Japan or India and still another in Australia or at the Cape, would doubtless find means of existing, especially since the *FERN BULLETIN* has developed a wide circle of fern-lovers, many of whom would doubtless subscribe to the foreigners. This publication is pleased to think that in some measure the wide-spread knowledge of American ferns is due to its efforts, and believing this, suggests these other publications as a means of making the ferns of other parts of the earth equally well known. A new publication would of necessity have to begin with few pages and grow with the growth of the study, but a fern student with a turn for such things might find the experiment worth trying.

* *

Our thanks are due to Mr. W. H. Phillips, of Lemonfield, Holywood, Ireland, for various pamphlets of his own, relating to ferns. One of the most interesting of these is the list of his wild finds which numbers upward of 200 plants. Most of these are variants from the normal and the length of the list shows what a fern student can do who has his eyes about him. Particularly pleasing, also, is his reminiscent paper upon his days of fern hunting.

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In this issue we publish a communication from the eminent fern-student, Dr. H. Christ, in regard to the species of *Scolopendrium* from Chiapas, Mexico, which Mr. W. R. Maxon has recently given specific rank as *Phyllitis Lindenii*. For the benefit of our readers who do not read French, we would say that Dr. Christ, having lately received specimens from Chiapas, is convinced that they are the same as *Scolopendrium vulgare*, the

slight differences in the Mexican plants being due to the locality, and easily paralleled by specimens from the warmer parts of the Old World. In holding this view, Dr. Christ agrees with such fern students as Hooker and D. C. Eaton, and probably expresses the opinion of most students regarding the specimens in question.

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Some of our subscribers have recently complained that THE FERN BULLETIN reaches them in a very crumpled state. It is our intention to have the magazine appear in a flat and unwrinkled condition, and if those who do not receive it in this shape will notify us, we will try to remedy the trouble. There is no reason for the magazine being crumpled in the mails.

NOTES.

"The Pteridophytes of Minnesota," by Harold L. Lyon, has recently appeared in "Minnesota Botanical Studies." Sixty-nine species and varieties are listed, with notes on their distribution. It is to be regretted that the nomenclature of the list is not the one in general use. This fact, however, seems to be appreciated by the author, who gives the better known names as synonyms. It is likely to be several centuries before fern students will adopt *Filix* for *Cystopteris* or *Matteuccia* for *Struthiopteris*.

In the Japanese "Botanical Magazine," for April, there is a list of Korean ferns collected by T. Uchiyama, which is of interest from the number of species it contains that are also found in Eastern America. Among them are the sensitive fern, ostrich fern, marsh fern, male fern, beech fern, silvery spleenwort, lady fern, bracken, royal fern and grape fern. Among the fern allies are listed *Marsilia quadrifolia*, *Salvinia Natans*, and three of the *Equisetums*. The number of species that are common to Eastern Asia and Eastern America is a never ending wonder to botanists. No doubt in time there will be students to suggest that the species are not identical because of the distances that separate them.

In "A Study of Certain Mexican and Guatemalan Species of *Polypodium*," published in "Contributions from the United States National Herbarium," William R. Maxon has made five new species of *Polypodium* out of the specimens which other students have referred to *P. subptiolatum*, *P. biserratum* and *P. Schaffneri*, basing his conclusions largely upon the quality and disposition of the pubescence. Although the reviewer is unable to judge of the distinctness of these species without seeing specimens, he is of the opinion that pubescence is not of enough importance to warrant the taking of diagnostic characters from it.

In the *Torrey Bulletin* for January, Dr. L. M. Underwood published "An Index to the Described Species of *Botrychium*," in which six new species are described. Most, if not all, are segregates or varieties with "slight environmental characters," among them the Jamaican form of *B. virginianum* which is named *B. dichronum* in allusion to its possessing two fronds at one time. As the collector of the type specimen has pointed out, this second frond is that of the preceding year, minus its fruiting portion, which the mild climate of Jamaica allows to remain through the winter. A similar state of affairs exists in the United States in the case of *B. ternatum*, which being hardier, endures our winters unharmed. Since there are no hard and fast lines limiting species, every author is free to consider species as varieties or varieties as species, as to him seems best, but the reviewer, who collected the specimen from which the new species was described, believes that the Jamaican plant is a mere geographical form of the other.

BOOK NEWS.

The first part of Dr. Grout's "Mosses with Hand Lens and Microscope,"* an amplification of his previous work, "Mosses with a Hand Lens," has just appeared. If the other parts are up to the standard of the present one, the whole work cannot fail to be of great value to moss students. It is very fully illustrated,

*Mosses with a Hand Lens and Microscope, by A. J. Grout, New York. Published by the author. 1903. 86 pp., 4to. \$1.00.

and contains, besides the original drawings, many excellent plates reproduced from Sullivant's "Icones," "Bryologia Europea" and other sources. Some of these plates are regarded as among the finest ever made. This first part deals with such subjects as how to collect, mount and study mosses; life, history and structure of the moss plant, and a very full illustrated glossary. Then follows an account of the first seven families of mosses with descriptions of the more common species, in which the more important distinguishing characters are italicized. In the matter of nomenclature the author makes the commendable statement that "The principle of priority has been allowed great weight, but usage also has its claims, and a name long in common use has not been discarded unless clearness and convenience seemed to demand it."

Maud Going's "With the Trees"[†] is not a manual for their identification, but another of the books which treat of the trees from the popular standpoint. It is packed full of information about them—how they live and grow, their uses, the myths and poetry connected with them, as well as much pleasant gossip about them in the author's attractive style. It is a book in which the lover of nature will find much to interest him.

Flower cultivators who are looking for a practical guide in their work, would do well to see Ida D. Bennett's "The Flower Garden,"[‡] which deals with all branches of the subject, beginning with the location and arrangement of the garden, and ending with the care of house plants in winter. The perplexed gardener will rarely be disappointed when turning to this book for assistance. There is a list of the common names of plants, with data of the length of time needed for the seeds of each species to germinate, and another list which gives the blooming season and notes whether the plants are hardy or not.

Under the editorship of Harry Roberts, there is being issued a series of "Handbooks of Practical Gardening," from the British standpoint, which will interest all Americans who would like to

[†]With the Trees, by Maud Going. New York. The Baker and Taylor Co. 1903. 12 mo., 323 pp. \$1.00 net.

[‡]The Flower Garden, by Ida D. Bennett. New York. McClure, Phillips & Co. 12 mo., 275 pp. \$2.00.

know how gardening operations are carried on, on the other side. Nearly twenty books in this series have been issued, among the latest of which may be mentioned "The Book of Pears and Plums,"* which also treats of cherries and mulberries; "The Book of Climbing Plants," which includes climbers under glass as well as in the open, and has a large amount of information upon hardy wall shrubs; and "The Book of the Wild Garden," dealing with the planting and treatment of hardy perennials. The latter is especially valuable, since it gives a very extensive list of plants, alphabetically arranged, in which will be found data as to their height, time of blooming, colors, kind of soil required, with suggestions as to the locations in which they should be planted and much other matter.

*The Book of Pears and Plums, by E. Bartrum; The Book of Climbing Plants, by S. Arnott; The Book of The Wild Garden; by S. W. Fitzherbert. London and New York. John Lane. 1903. \$1.00 each.

THE LINNEAN FERN CHAPTER OF THE AGASSIZ ASSOCIATION

Before this issue of THE BULLETIN comes to hand, the long delayed annual report of the Chapter will probably have been received by its members. In it an amendment to the Constitution is proposed, and it is earnestly desired that all members will send a ballot for or against as soon as possible. The polls will close August 15.

Miss Laura F. Kimball has a number of fine specimens of *Asplenium vespertinum* Maxon, which she sends word that she will distribute among such members of the Chapter as may desire them. This is an unusual opportunity to obtain a rare species at a merely nominal cost. Those who want it will send six cents in stamps to Miss Kimball, whose address is National City, Cal.

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"Among Green Trees" came in due time and I am delighted with the book. I think the publisher is to be congratulated as well as the author. The royal size, green cover, enameled paper, wide margins and open, perfect type all strike my eye. Finest of all are the photogravures. I have been greatly interested in the reading. I did not know the tree story could be told so faithfully and so fascinatingly. I am proud to have the book among my books—*Professor J. Vullance Brown, Tarkio College, Tarkio, Mo.*

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A. W. MUMFORD

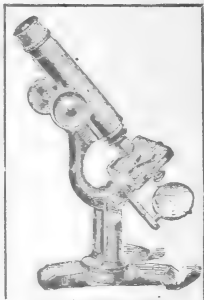
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ALL GONE

Almost as soon as the April FERN BULLETIN was in the mails, the early back numbers offered therein were sold. And the orders continued to come—even from Europe. This is the first opportunity we have had to explain the situation and we hasten to say that

We have no numbers earlier than Vol. VI.

and the orders for other volumes so cut into our stock that we now have only 30 sets of Vol. VI. This means that only 30 more of our subscribers can have complete files from Vol. VI., No. 1. *Verbum sat.* Vol. VI. will not be sold separately, except to subscribers.

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Vol. XI.

No. 4.

The Fern Bulletin.

A Quarterly Devoted to Ferns.

OCTOBER

Binghamton, N. Y.
THE FERN BULLETIN CO.

1903

THE FERN BULLETIN

A QUARTERLY DEVOTED TO FERNS

WILLARD N. CLUTE, Editor

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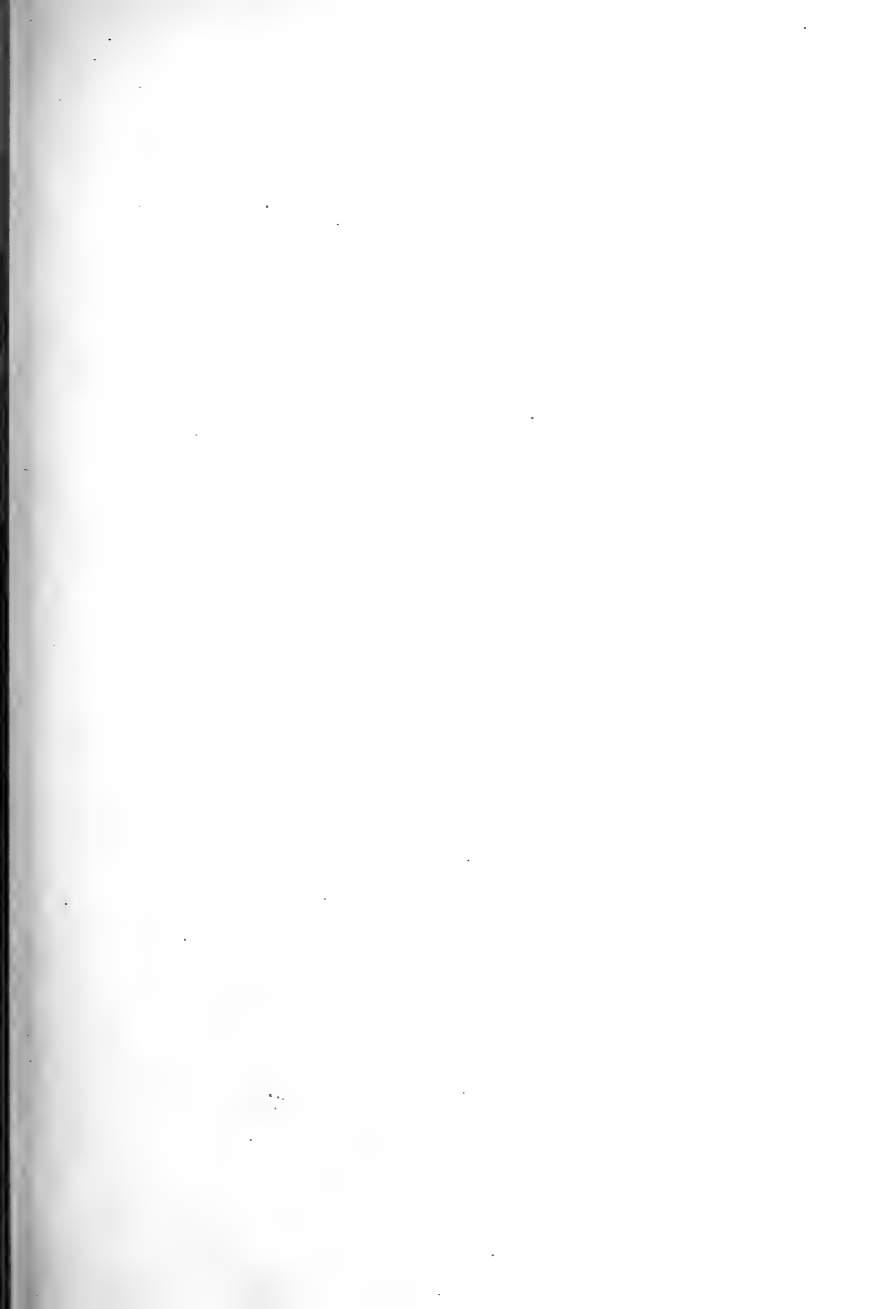
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WILLIAM RALPH MAXON.

THE FERN BULLETIN

VOL. XI.

OCTOBER, 1903.

NO. 4

THE FERN FLORA OF NEW YORK.

By B. D. GILBERT.

The State of New York has the largest area of any northern State east of Michigan. It also possesses a great diversity of surface, with its two mountain ranges, its numerous lakes, its interior salt basin, and its seashore confined entirely to the southern extremity. On its eastern side it stretches through more than four degrees of north latitude, and as these are the degrees just south of the 45th parallel, it is easy to understand that there is liable to be a greater intermixture of northern and southern forms of ferns than there would be in a State lying farther south. And the fact is that certain species from the north and others from the south do meet within its borders. This also accounts for the large number of species found in the State: California and Texas, the one State having four times the area of New York, and the other five times that area, being the only ones which contain as large or a larger number of species.

For the purpose of fern classification, the State may be divided into four distinct zones, as follows:

I. THE LITTORAL.—This comprises Long Island and Staten Island. Only one fern is peculiar to this zone, viz. *Woodwardia angustifolia*; but there are two Lycopods, viz. *L. alopecuroides* and its variety *adpressum*.

II. THE CATSKILL MOUNTAIN REGION, extending down to Manhattan Island.—This being the southern mountain range of the State, it is here that three southern species find their northern limit, viz. *Asplenium Bradleyi*, *A. montanum* and *Cheilanthes vestita*. It may be a question whether the Connecticut stations for *Asplenium montanum* lie farther north than the New York stations, but it is certain that there can be but little difference between them in this respect.

III. THE ADIRONDACK REGION, extending as far south as Little Falls.—Here there are a few of the northern species that descend to their southern limit in this country. Among them may

be mentioned *Nephrodium fragrans*, *Polystichum Braunii*, *Wood-sia glabella*, and *W. hyperborea*. There are also two Lycopods to be included in this list, *L. annotinum pungens* and *L. Sitchense*.

IV. THE WESTERN REGION, extending from the mountain regions to the State's western boundary, the southern part drained by the Susquehanna and its tributaries, and the northern part containing (a) *The Salt Basin* of Syracuse and its vicinity, the home of *Scolopendrium* and *Botrychium Onondagense*, and (b) *The Central Basin*, extending from Little Falls to Oneida Lake, and drained by the Mohawk River, being famous for its large number of *Botrychia*, some of which seem to be almost, if not quite, peculiar to this region.

In the preparation of this list I have consulted various local floras and other reports of the State, especially Paine's "Catalogue of Plants Found in Oneida County and Vicinity;" the Annual Reports of the State Botanist, "The Flora of the Upper Susquehanna," and the files of the FERN BULLETIN. I have also been favored with many notes from the State Herbarium sheets by Professor Peck himself; while my own herbarium and that of Dr. J. V. Haberer, of Utica, have been exceedingly useful in fixing definite localities.

The plan I have followed is to include along with the species only such varieties as seem to be most important and distinct.

Mr. Bush in *The Torrey Bulletin* for June, 1903, enumerates 59 species and varieties of ferns found in Texas. This compares well with our list of 64 species and varieties in New York State, of which only 18 of these are common to both States. Mr. Reverchon's list for Texas, published in the FERN BULLETIN, April, 1903, gives 51 ferns and 15 allies, or 66 in all. The present list includes 53 species and 12 varieties of ferns, and 23 species and 7 varieties of fern allies. If we take Bush's ferns and Reverchon's allies, there are 74 species and varieties known in Texas, or 20 less than I have enumerated in New York.

OPHIOGLOSSACEAE.

Botrychium lanceolatum Angs. Open upland woods in the eastern part of State. Not reported from western part. Scarce.

Botrychium matricariaefolium A. Br. In same localities with *B. lanceolatum*, but more plentiful.

Botrychium obliquum Muhl. GRAPE FERN. Abundant in pastures and woodlands, especially in the central part of the State.

Botrychium obliquum dissectum Clute. In similar places with *B. obliquum* and always associated with it. Frequent.

Botrychium obliquum f. elongatum Gilbert & Habereri. Scarce in pastures, eastern New York.

Botrychium obliquum Habereri Gilbert. Scarce. Mohawk Valley, Catskill Mts., and probably occasional elsewhere.

Botrychium obliquum intermedium Clute. Pastures. Occasional in the eastern part of the State.

Botrychium obliquum matricarioides Gilbert. Beaver Lake, Lewis Co.; Whitestown: Gilbert. I have seen no other specimens from this State, but Dr. Underwood cites "Northern New England and New York." (*Osmunda matricariae* Schrank.)

Botrychium obliquum Oncidense Clute. Pastures and open woods. Occasional.

Botrychium obliquum tenuifolium Gilbert. Field near top of mountain, Shandaken, Ulster Co., Mary F. Miller. As I possess tracings of Dr. Underwood's type specimens of *B. tenuifolium* Und., I am able to say that these specimens from Shandaken match the tracings completely. (*B. tenuifolium* Und.)

Botrychium Onondagense Underwood. Within a radius of five miles from Syracuse. The stations there are the only ones known in the State.

Botrychium simplex E. Hitchcock. Damp meadows and sandy swamps in Central and Northern New York. Also Wading River, L. I., E. F. Miller.

Botrychium tenebrosus A. A. Eaton. Baldwinsville, L. M. Underwood; Deerfield and Cedar Lake, J. V. Habereri. Probably not rare, but escapes notice because of its minute size.

Botrychium Virginianum Sw. RATTLESNAKE FERN. In rich woods. Common.

Ophioglossum vulgatum L. Frequent in damp ground throughout the State.

OSMUNDACEAE.

Osmunda cinnamomea L. CINNAMON FERN. Swamps. Common.

Osmunda Claytoniana L. INTERRUPTED FERN. Along roadsides and in thickets.

Osmunda regalis L. ROYAL FERN. Widely spread, but not so abundant as *O. Cinnamomea*.

SCHIZAEACEAE.

Lygodium palmatum Swz. CLIMBING FERN. Hunter, Green Co. and McDonough, Chenango Co., *Professor Peck*. The only localities known in the State.

POLYPODIACEAE.

Adiantum pedatum L. MAIDEN HAIR. Plentiful throughout the State.

Asplenium angustifolium Michx. NARROW-LEAVED SPLEENWORT. Damp, shady soil, common.

Asplenium Bradleyi D. C. Eaton. Near Newburg, *D. C. Eaton*; Shawangunk Mts., *C. Lown* in State Herbarium. Rare.

Asplenium ebeneum Ait. EBONY SPLEENWORT. Frequent on edges of woods or rocks throughout.

Asplenium ebenoides R. R. Scott. Near Saugerties, Ulster Co., *C. Lown*, in State Herbarium. Rare.

Asplenium montanum Willd. On rocks about Lakes Mahonk and Minnewaska, *Prof. C. H. Peck*. New Paltz, *H. Denslow*. Rare.

Asplenium ruta-muraria L. WALL RUE SPLEENWORT. Limestone cliffs. Helderberg Mts., *Professor Peck*. Spraker's and Chittenango Creek, *Paine*. Little Falls, *Gilbert*. Not common.

Asplenium Trichomanes L. MAIDEN HAIR SPLEENWORT. On limestone rocks. Middle and eastern parts of the State. Localities comparatively few. Common in the southern part, *Clute*.

Athyrium filix-foemina Roth. LADY FERN. Very common everywhere. About 15 varieties occur in State.

Athyrium Thelypteroides Desv. SILVERY SPLEENWORT. Damp woods. Common.

Camptosorus rhizophyllus Link. WALKING FERN. On shaded rocks. Not common but widely scattered.

Cheilanthes vestita Swz. Rare. Washington Heights, Manhattan Island, *W. W. Denslow* in herb. *Gilbert*; Poughkeepsie, *Professor Peck*.

Cystopteris bulbifera Bernh. Rocky banks and ravine sides near water. Common in the central, rare in the southern part of the State.

Cystopteris fragilis Bernh. FRAGILE BLADDER FERN. On gravelly hillsides and moist rocks. Common. Two varieties of this are occasionally met with, viz. *dentata* Hook. and *magnasora* Clute.

Dicksonia pilosiuscula Willd. Abundant. Growing in large beds along roadsides and in moist woodlands.

Nephrodium Boottii Davenp. Frequent in damp woods throughout the State.

Nephrodium cristatum Michx. CRESTED FERN. Common in swampy grounds.

Nephrodium cristatum Clintonianum Gilbert. Growing generally with the type.

Nephrodium fragrans Rich. FRAGRANT FERN. Lake Avalanche and Cascadeville on cliffs. *Professor Peck*. Rare.

Nephrodium Goldienum Hook. Occasional in swampy ground throughout the State.

Nephrodium marginale Michx. Plentiful in rocky woods.

Nephrodium Noveboracense Desv. NEW YORK FERN. Common in damp woods and thickets.

Nephrodium simulatum Davenp. Middle Village, L. I., *Rev. G. D. Hulst*; Babylon and Bellville, L. I., *W. N. Clute*; Oneida Lake, *H. D. House*. Rare.

Nephrodium spinulosum Desv. Probably rather common, but not recognized. Grows in damp woods throughout the State.

Nephrodium spinulosum dilatatum Baker. Infrequent. Catskill and Adirondack Mts., *Professor Peck*; Yates Co., *Sartwell*. In more elevated situations than the type.

Nephrodium spinulosum f. *intermedium*. Davenp. Our commonest woods fern.

Nephrodium thelypteris Desv. MARSH FERN. Abundant in wet ground, whether shaded or not.

Onoclea sensibilis L. SENSITIVE FERN. Common in swampy ground.

Pellaea atropurpurea Link. On cliffs both in eastern and western New York. Scarce.

Pellaea gracilis Hook. SLENDER CLIFF BRAKE. Not common,

but occurring in many localities through the State. Always on rocks or cliffs.

Phegopteris Dryopteris Fee. Common in rich, damp woods.

Phegopteris hexagonoptera Fee. Rather scarce, but more frequent in the southern and western parts of the State.

Phegopteris polypodioides Fee. Common on wet rocks and in damp woods.

Polypodium vulgare L. COMMON POLYPODY. Common on rocks.

Polypodium vulgare cristatum Lowe. Rock City, Dutchess Co., Charles A. Coons.

Polystichum acrostichoides Schott. CHRISTMAS FERN. Common in woods. The variety *incisum* with the type.

Polystichum Braunii Lawson. Summit, Schoharie Co., Catskill and Adirondack Mts., Professor Peck; Ilion ravine, Rev. H. M. Simmons in herb. Gilbert.

Pteris aquilina L. BRACKEN. Common throughout the State.

Pteris aquilina pseudocaudata Clute. The common form on many parts of Long Island. Clute.

Scolopendrium vulgare J. E. Sm. HART'S TONGUE. Rare. Only in ravine of Chittenango Creek, Green Lake, Jamesville and a few other stations in the vicinity of Syracuse.

Struthiopteris Germanica Willd. OSTRICH FERN. Frequent in the Valley of the Mohawk and its tributaries. Western part of the State, Torrey; Southern tier, Clute.

Woodsia glabella R. Br. Crevices of rocky ledges at Lake Avalanche and in the pass north of it, Professor Peck; Haines' Falls, Catskill Mts., Professor Peck. The station at Little Falls has been destroyed by excavation.

Woodsia hyperborea R. Br. Rare. Adirondack Mts. Only three stations known—at Cascadeville, Lake Avalanche, and Ampersand Mt., Professor Peck.

Woodsia ilvensis R. Br. RUSTY WOODSIA. On rocks and cliffs. Rather scarce.

Woodsia obtusa Torr. In rich woods and on rocks. Widely spread but not common.

Woodwardia angustifolia Sm. Flatbush and Middle Village, L. I., Professor Peck; Babylon and Bellville, L. I., Clute; Staten Island, Torrey.

Woodwardia Virginica Sm. CHAIN FERN. Frequent in swamps from Long Island to the western part of the State.

EQUISETACEAE.

Equisetum arvense L. FIELD HORSETAIL. Very common in either wet or dry soil. Mr. Eaton describes a dozen different forms.

Equisetum fluviatile L. Borders of lakes and ponds. Not uncommon.

Equisetum palustre L. Swamps near Buffalo, Clinton, according to Eaton. Rare.

Equisetum hiemale L. SCOURING RUSH. Very common in swampy and gravelly places. Eaton describes seven forms.

Equisetum hiemale intermedium A. A. Eaton. Oneida Lake, Dr. J. V. Haberer. Rare.

Equisetum scirpoides Michx. Shaded ravines and sphagnum marshes. Widely scattered but scarce.

Equisetum sylvaticum L. WOOD HORSETAIL. Marshes and borders of woods. Not uncommon. Eaton enumerates seven forms.

Equisetum variegatum Schleich. Brisbin Swamp, Coville; Oriskany and shores of Lake Ontario, Paine; Owasco Lake, Prof. I. H. Hall; along W. Canada Creek, near Herkimer, J. V. Haberer.

ISOETACEAE.

Isoetes Amesii A. A. Eaton, sp. n. (*I. riparia Canadensis* Engelm. Also *I. Dodgei* Eaton.) Peekskill is the only known locality in this State, but the species is very common in New England.

Isoetes echinospora Braunii Engelm. The common form in New York State.

Isoetes echinospora muricata Engelm. Lake Luzern, A. A. Eaton. Rare.

Isoetes Engelmanni A. Br. Abundant along the Susquehanna river in Broome and Tioga counties, Clute. New York City, Buchheister.

Isoetes macrospora Durien. Catskill Mts., Schweinitz, according to A. A. Eaton. (*I. lacustris paupercula* Engelm.) Rare.

LYCOPODIACEAE.

Lycopodium alopecuriodes L. Babylon, L. I., Clute. Rare.

Lycopodium alopecuroides adpressum Chapm. Babylon, L. I., Clute; Forbell's Landing, L. I., M. Zimmerman. Rare.

Lycopodium alopecuroides f. *polyclavatum* McDonald. Staten Island, Clute. Rare.

Lycopodium annotinum L. Damp woods. Rather scarce, especially in western part of State.

Lycopodium annotinum pungens Spring. Summits of Mt. Marcy and Mt. McIntyre, Professor Peck.

Lycopodium clavatum L. COMMON CLUB MOSS. Abundant in open woods and thickets. The var. *monastachyon* Hook. was found on Bald Mt., Fulton Chain, by Dr. Haberer.

Lycopodium complanatum flabelliforme, Fernald. Common.

Lycopodium complanatum Wibbei var. n. J. V. Haberer. Scarce. Mohawk Valley. Haberer in herb. Gilbert and in herb. Gray, No. 1,953.

Lycopodium inundatum L. Bogs and borders of swamps. Frequent except in southern and western part where it is rare.

Lycopodium inundatum Bigelovii Tuckerm. Riverhead, L. I., Professor Peck.

Lycopodium lucidulum Michx. On damp grounds or rocks. Common.

Lycopodium obscurum L. Woods. Common.

Lycopodium Selago L. Summits of Mts. Marcy and McIntyre and in Indian Pass. Professor Peck. Alpine and rare.

Lycopodium Sitchense Rupr. In pass between Nipple Top and Mt. Colvin and on side of Mt. Marcy, Professor Peck. Alpine and rare.

Lycopodium tristachyum Pursh. Cold Spring Harbor, L. I., Prof. F. E. Lloyd; Ray Brook, Essex Co., Caroga, Fulton Co., Professor Peck. Alden Creek, Gilbert. Infrequent.

SALVINIACEAE.

Azolla caroliniana Willd. Floating on water. Frequent. Cayuga Lake, Black Creek, Professor Peck; in all side waters of Lake Ontario, Paine.

SELAGINELLACEAE.

Selaginella apus Spring. Wet banks and pastures. Uncommon. Cedar Lake, Herk. Co., Paine; borders of Rome swamps, Knciskern; head of Oneida Lake, Haberer; Unadilla, Brown.

Selaginella rupestris Spring. On dry open rocks. Rather

scarce. Little Falls, *Paine*; Adirondacks, *Professor Peck*; Washington Heights, *W. W. Denslow*. Plentiful in the extreme south-east, *Clute*.

FERNWORT NOTES—IV.

BY WILLARD N. CLUTE.

NEPHRODIUM MOLLE IN FLORIDA.—Mr. James H. Ferriss recently called my attention to specimens of *Nephrodium molle* received from Florida with the suggestion that this species might be native to the State. On this point, Reasoner Brothers, the well-known plant dealers, have written him that they no longer grow the fern since it is abundant in a wild state and easily obtained when wanted. There seems to be no reason why the species should not occur in Florida, since *Nephrodium patens*, a close ally, is common there; but as *N. Molle* is not listed from the United States, we publish this note in the hope of drawing out further information about it and of ascertaining if possible whether *Molle* is actually native, or only a well naturalized escape. Superficially, *molle* and *patens* are so very much alike that it is very easy to confuse them. The venation, however, is a sufficiently distinct feature. In *patens* the basal veins in each pinnule run to the sinus, uniting at, or just below, it; in *molle* they unite at some distance from the sinus from whence a single vein runs to the sinus. According to Jenman, *patens* has a creeping horizontal rootstock with the fronds arranged in two lines along it, while *molle* has an erect rootstock. The fronds of the latter are also softer and thinner.

NATURALIZATION OF AN EXOTIC FERN.—Records of ferns becoming naturalized in new regions are very rare. *Pteris serrulata* is probably our most conspicuous American example, having been found as an escape in several places, while it is known to grow abundantly on old walls in New Orleans. I have also reported the occurrence in the same place, of an abundance of *Pteris longifolia* previously known in the United States from Florida alone. In the FERN BULLETIN for January, 1898, mention is made of fronds of *Pteris tremula* seventeen inches high collected from the walls of a tunnel in New York City, and the same article mentions a Japanese species of *Athyrium* that has

become naturalized on Staten Island, New York. To this meagre list, it is with much pleasure that I add another species in the shape of the Japanese climbing fern (*Lygodium Japonicum*). This Mrs. A. P. Taylor has sent to me from Thomasville, Georgia, where she finds it in profusion along the sides of a deep ditch. The station is not far from a greenhouse from whence the plants doubtless came in the first place, but all indications point to a further spread of this pretty and interesting species.

THE FORMS OF THE SPINULOSE WOOD FERN.—It is well-known to fern students that much more attention has been paid to the forms of ferns on the other side of the Atlantic than on this. Since the same species are often common to both localities, it is but natural that the early students of American ferns should pay rather more attention to the mere forms of species common to Great Britain and America than their systematic importance warrants. This is especially true of the variable *Nephrodium spinulosum* whose variety *intermedium*, I am convinced, is scarcely more than an ecological form. In this view I am glad to be borne out by Mr. A. B. Klugh, who has recently examined nearly 500 Canadian specimens and come to the same conclusion. Mr. Klugh writes: "In number of glands on the indusium, in color of scales on the stipe, in shape and cutting of the frond and in degree of obliquity of the pinnae, we have a perfect gradation from true *spinulosum* to typical *intermedium*. Our commonest form has the indusium glandular and the scales of the stipe pale brown without a dark centre." In a series of fronds examined there seemed to be no correlation between the color of the scales and the glands on the indusium, there being fronds with light scales and no glands, others with dark centered scales and many glands, and still others the exact opposites of these. *Intermedium* may be distinguished as a form, but it is certainly far less distinct than such plants as *Nephrodium cristatum* *Clintonianum* or *Pteris aquilina pseudocaudata* and would probably never have appeared in our lists but for the fact that much has been made of the forms of this species in other lands.

ELEVATION AND LYCOPODIUM SELAGO.—Some time ago I noted in this series, that a party of botanists on a visit to Mt. Ktaadn had found *Lycopodium selago* grading into *L. lucidulum* as they

traveled downward from the summit, and quoted their opinion that *L. selago* is a xerophytic form of *L. lucidulum*. In regard to this, Mr. J. B. Flett writes that if the one intergrades with the other, it is doubtless due to elevation or cold, and not to xerophytic conditions. As to the plant's habitat in the northwest, he says: "I have never seen *L. selago* growing in a really dry place, I have studied this form in the field from Washington through British Columbia into the islands of southwestern Alaska and on the Aleutian Islands, also on the tundra between Cape Nome and Cape York. No one familiar with this tundra region would ever assert that there are any xerotic forms on it."

SCOLOPENDRIUM FROM CANADA.

By HOMER D. HOUSE.

At least four stations for the Harts-tongue fern are known in the vicinity of Owen Sound in northwestern Ontario. Specimens from these localities are rare in herbaria, and the writer is fortunate in receiving specimens from near Collingwood, a station twenty-three miles east of Owen Sound. This station was first authentically reported by Mr. Osler and described by Mr. Maxon in "Fernwort Papers" in 1900. These specimens were collected by Dr. W. A. Bastedo and he describes the place where they were collected as being five or six miles from Collingwood. The plants were growing in a shady, though rather open wood, along the course of a small stream. The altitude is given as 1635 feet above sea-level. The plants at the time of collection, July 17th, 1903, were nearly all young and even the mature fronds are but five to eight inches in length, though all of them are very broad for their length. Dr. Bastedo further notes that in the recesses of the cliff, snow was still abundant at that date. *Polystichum Lonchitis* and *Dryopteris Filix-mas* were abundant and *Asplenium Trichomanes* and *Cryptogramma Stelleri* were common upon the cliffs. This station is undoubtedly one of those described by Mr. Maxon in the neighborhood of Collingwood. However, a careful search of this entire region is very much to be desired, as it is probable that the fern has a more general distribution in this region than is known at present.

THE GENUS *EQUISETUM* IN NORTH AMERICA.

BY A. A. EATON.

FIFTEENTH PAPER.

VARIETIES OF *E. HIEMALE*.

1. *Intermedium* A. A. Eaton. Stems 1 to 4 feet high, 1 to 4 lines in diameter, simple or ultimately branched, 20 to 30 angled, rough with transverse bands of silex or becoming smoother by a later deposit covering them; sheaths longer than broad, amplified, green excepting narrow black and white incurved limb, or exceptionally with other black and white markings; leaves keeled below the middle, flat and often centrally grooved above; teeth thin, brown, hyaline-bordered, deciduous or persistent; anatomy of *hiemale* as previously described. New York, Michigan and westward. Common west of the Mississippi, being an important forage crop in some States. The anomalous *laevigatum* collected by Rydberg at Thedford, Neb., No. 1283 (Cont. Nat. Herb. III, 194), is this variety, as is the plant referred to under the name of *variegatum* by V. K. Chestnut (Cont. Nat. Herb. VII, 304), as used for various unimportant purposes by the Indians of Mendocino County, California. He also mentions the fact that horses eat it even when grass is abundant.

2. *Texanum* Milde. Stems erect, very slender, somewhat rough, 10 to 12 angled, hardly 1 foot high, dirty green; sheaths elongated, slightly widened, 2 to 2 1-3 lines long and 1 1-3 wide, concolorous, leaves flat, centrally grooved and 4 angled above and centrally ridged below; teeth persistent, flexuous, white with red-brown center, lance subulate, smooth, only the lowermost three sheaths red-brown; ridges convex; carinal bast 7, vallecular 4, cells high, vallecular holes transverse oval; stomata rows separated by 7 to 8 cells, grooves naked, lumen of epidermal cells very wide, angles with broad, short bands, never with two rows of tubercles. Texas, Chas. Wright.

This is Milde's description. I have never seen this plant. Milde states that it is a very peculiar plant that equals the weakest specimens of var. *Moorei*, but differs greatly from it, and he asks if it may not be the young stage of a larger species.

3. *Herbaceum* var. nov. Cespitose, decumbent, ascending or

erect, 3 to 10 inches high, $\frac{1}{2}$ to 1 line in diameter, 6 to 12 angled, weak and herbaceous or becoming firmer the second year, usually bearing a single branch 1 to 2 inches long at each node. Walls of the stem thicker than in *hiemale*; ridges with long cross-bands; grooves naked, except for small spots of silex on the cells; sheaths elongated and very wide-spreading, with a narrow black band at tip, otherwise green or (in dried specimens at least) all suffused with black; leaves 3-angled or flat in the middle above, rarely bearing a central groove; teeth fuscous, flexuous, deciduous, leaving a hard, horny, centrally grooved erect or incurved, usually shining, borderless leaf base $\frac{1}{2}$ its height; spikes narrowly elliptical, rounded, not apiculate. *Coville & Funston*, 1297, Death Valley Exp., banks of Kaweah river at Three Rivers, Tulare Co., Calif., July 26, 1891 (Nat. Herb., 25, 101), as *variegatum*. Three little plants, 3 inches high, well fruited (Cont. Nat. Mus. IV, 226). *C. & F.*, 1042, 1 mile south of Kernville, Kern Co., Calif., on north fork of Kern river, Alt., 750 meters, June 23, 1901, as *variegatum* (Nat. Herb., 25100).

In some of its characters, such as sheaths and persistent, incurved leaf-bases, this plant resembles *Funstoni*, but the section is similar to *hiemale*. An abundance of material might show this to be a good species. The only thing I have seen that approaches it in texture is *E. Sieboldi* Milde from Japan, which is even more grass-like.

4. *Pumilum* var. nov. Cespitose; stems in a dense cluster, 6 to 15 inches tall, 8 to 16 angled, $\frac{1}{2}$ to 1 line in diameter, mostly geniculate at the lower nodes, nearly all the joints tumid, the lower gibbous; ridges with cross-bands of silex, grooves naked; sheaths tight, often symmetrical through the tumidity of the node, narrowest in the middle except where nodes are normal, bearing a broad black band below and a narrower black limb, the two separated by a pinkish or dirty white band which is often suffused with black or even entirely black towards the top of the stem, fading to dirty ashy the second year, ultimately splitting, recurving and falling off in patches; leaves linear, erect, prominently 3-angled, the central one sometimes grooved on the smallest stems and branches; teeth persistent, dark

brown, somewhat flexuous, white-bordered for 1-5 to 1-4 their height.

Found at intervals for a mile along the railroad grade at North Hampton, N. H. At the foot of the grade, in moist soil near a brook, probably from the same source as this, a form of *affine* grows, but the joints are often tumid and occasionally geniculate, the branches when present like stems of this, tumid jointed, often so gibbous as to rupture the sheath. Peculiar for its small cespitose stems, dark sheaths and especially the tumid or gibbous nodes, which make the stems thickest there, while usually the nodes are contracted.

This is near the European variety *viride* Milde, but differs in having bands on the ridges, no rosulæ in the grooves, and in the tumid joints.

5. *Suksdorfii* var. nov. Stems 1 to 2½ feet high, 1 to 3 lines wide, about 24 angled, rough, with cross-walls of silex, rarely with ends elevated to two rows of tubercles; stomata in single rows, rarely double for a short distance, each stoma connected at top and bottom with its opposite by rows of rosulæ formed by the silex bands of the grooves throwing up tubercles on each cell of the epidermis, which open at top to circular jagged disks, these often obscured later by a washing of silex, but always shown near the tops of the stems and on the branches; sheaths elongated, cylindrical, tight, black, developing a ring of tawny white which gradually increases till it occupies the whole sheath except a narrow black basal ring and a narrow black limb formed by the horny tips of the leaves; leaves linear, narrowed above the middle, the lower 2-3 keeled, the upper third flat, rarely with a narrow carinal groove above, tipped with a small, black, horny, hyaline-bordered point; teeth articulated to the leaves, black-centered, soon fading, withering and deciduous.

Anatomy of *hiemale*, the carinal bast elongated along the dissepiment, the vallecular much smaller but often similar in shape. Upper 1 to 3 nodes bearing 1 to 4 branches each, which overtop the stem and bear contemporaneous spikelets.

This would be a noteworthy variety even if it bore no branches. It is the only American form of *hiemale* known to me, except occasionally *intermedium* which bears branches with the first

effort of growth. All the others develop them, if at all, after the stem has ceased to grow, and the vegetative energy, having no other outlet, pushes out a few of the latent buds lying between the ridges at the nodes.

Bingen, Wash. High bottom land on the Columbia river. *W. N. Suksdorf*, September 3, 1902, No. 2161.

6. *Drummondi* (Milde) *C. robustum Drummondi* Milde, Mon. Equis. 593. Fertile stems 3 feet high, 16 angled; sheaths short, the lowest fuscous; teeth persistent, white, crispate; stomata often of 1 to 3 lines to a series, which are separated by 4 to 6 cells.

Collected by Drummond at the Brazos river in Texas. It is very aberrant, but is placed here on account of its anatomy. I have not seen specimens of this.

7. *Affine* (Eng.) (*E. robustum affine* Eng.) *E. hiemale* of American authors, not L. Stems 18 to 30 inches high, 2 to 5 lines in diameter, finely 16 to 40 angled, dark green, angles with broad bands of silex, rarely with two rows of tubercles. Internodes when dry contracted above and below, widest in the middle as in *hiemale*, scurfy when young; sheaths longer than broad, at first with a black limb, developing a broad ashy band and narrow black basal ring, fading, rupturing and deciduous the second or third year; leaves narrowly linear, sharply 3 angled, the central ridges only rarely centrally grooved except on the branches, where they usually are; commissural groove very narrow, not widened upward; teeth articulated to the sheaths, persistent or usually cohering by their tips and torn off by the growth of the stem, those of each sheath shaped like a candle extinguisher, all telescoped together and borne up on the tip of the stem.

Very common in New England and the east generally, where the type of *robustum* is absent. Toward the west it runs into the next, but it is occasionally found, even to the valley of Mexico (Pringle 3329). Approaches typical *hiemale* in its long sheaths and size, and differs little except in the cross-bands of silex. Found usually in moist sand near a watercourse; at times on high sandy banks. It is by no means certain that this is the variety described by Engelmann under this name, but

from the brief description he gives it seems safe to assume that it is. Two branched forms are found, as follows:

- a. *Forma ramosum* f. nov. (f. *Ramigerum* A. A. E., in Gilbert's list, p. 26, not A. Br. in Sched., which normally branches at the 3 to 5 middle nodes.) Stems issuing one to several branches from the upper nodes after the death of the top of the main axis; teeth usually persistent and leaves centrally grooved.
- b. *Forma polystachyum* Prager. Stems issuing small spiciferous branches late in the season. As remarked by Mr. Gilbert (List, p. 26), these forms are seldom found together and many patches show neither.

The stems of this variety persist at least three years and probably longer. I have found but two causes of death, old age not appearing as a factor. Both are fungoid. After the stem has persisted for a time small white patches appear under the epidermis of the upper internode. These increase in number and the internode finally dies, not, however, till the second one shows the disease. This may continue till the whole stem succumbs. The other fungus is a smut that breaks out in small pustules, finally opening in black patches the size of the head of a pin or smaller. They are usually numerous and the stem dies rapidly.

The growth of the stem is indeterminate, but as each succeeding section is a little smaller than the one below, the time arrives in the history of each when no more can be pushed out and the growth ceases. The undeveloped internodes soon die and thus the stem, if it grows at all, must put its energy into branches, as the silex coating prevents its increase in diameter.

9. *Robustum* (A. Br.) *E. robustum* A. Br. Stems 3 to 6 feet tall, 2 to 6 lines wide, 16 to 48 angled, simple or branched the second year; ridges rough with cross-bands of silex; grooves naked with a smooth coat of silex, and when young with a thin white scurfy coat that soon falls off; sheaths tight to the stem, or recurved and deciduous in fragments in age, as broad as long, soon developing a black girdle at base, an ashy or pinkish one through the middle and a black one above, the last usually very small, all variable in breadth and intensity of color; leaves linear, sharply 3 angled; commissural groove not widened above; teeth more or less persistent for a season, seldom torn off by the

growth of the stem, articulated to the leaves, cohering, in groups, brown centrally, with tawny margins $\frac{1}{2}$ their height, ending in filiform usually flexuous appendages, the edges beset with unicellular bristles; branches variable in number and length, the sheaths mostly like those of the stem except the teeth always persist and the leaves are usually grooved centrally; spikes usually green, oval, up to an inch long and half as wide, sharply apiculate. *Ramosum* and *polystachyum* forms occur in this as well as in *affine*.

Rare east of the Mississippi, where it is replaced by var. *affine*. Very common west, where it has been reported from nearly every State. I have seen it from but six localities in the Eastern States, Wallingford, Pa., *T. C. Palmer*; Towson, Md., *C. E. Waters*; Peoria, Ill., *F. E. McDonald*; Illinois, without locality, *Dr. Brendell*; Mattsville, Ind., *Guy Wilson*; Sarnia, Mich., *C. K. Dodge*; accredited to New Jersey by Milde, and also found in the Himalayas.

Var. *minus* Eng. is simply the same thing reduced, often growing with it. As there is already a variety *minus* of *hiemale* this name will not stand, and the form is of too little moment to merit another.

Stems of this can usually be recognized at a glance, but it is hard to embody the description in words that will enable one to separate it from *affine* at once. From *Californicum* it can only be separated by use of a lens, as their appearance is identical.

10. *Californicum* Milde. Plants of various appearance, now 15 inches high and 4 lines wide, now $7\frac{1}{2}$ to 8 feet tall and 8 lines wide, 25-40 angled; the ridges with two distinct rows of tubercles or occasionally with transverse bands of silex, the grooves abundantly supplied with rosulæ, either in regular rows or scattered, often indistinct on old stems because of a heavy deposit of silex; sheaths as broad as long, with a broad or narrow black or dark brown ring just above the base, an ashy band in the middle and another usually narrow dark band at top. In young plants the sheaths are usually concolorous with the stem save for the terminal band; leaves linear, 3-angled with two rows of tubercles on the middle angle; commissural groove narrow, slightly or not at all widened above; teeth persistent, dark brown, firm, united

two-thirds their height by bron borders; or brown-centered, flexuous, membranous-bordered, united or free, or early deciduous, leaving only a small dark brown spot at the tip of the leaves; branches none or few, short or up to 18 inches long, fruited or not, on the upper part of old stems.

Type. California *Balfour*, 1854. I have seen it from the following localities: California: Sacramento, *Wilkes Exp.* (Sheaths black, teeth persistent, near var. *Javanicum*); Berkeley, *W. C. Blasdale* (very stout, often with two rows of stomata); San Rafael, *Munson & Hopkins* (like last, but with one row of stomata). Arizona: Cedar Ranch, *MacDougal*. Nevada: Humboldt Mts., *Watson*. Utah: Fish Lake, *Jones*; Glenwood, *Ward*. Idaho: Peter Creek, *Sandberg*; Salmon, *Henderson*. Oregon: Port Discovery, *Wilkes Exp.* Washington: Tacoma, *Flett*; Klickitat Co., *Suksdorf*. British Columbia: New Westminster, *A. J. Hill*. (No rosulæ, occasionally two rows of stomata, extraordinarily thick coating of silex.)

Except the Berkeley and San Rafael plants these can be told from *robustum* only by aid of the microscope to see the tubercles and rosulæ. Though specimens vary considerably in appearance, the presence or absence of teeth, the size and intensity of the rings, a parallel can usually be found in a good series of *robustum*.

11. *Doelli*. Stems $1\frac{1}{2}$ to $2\frac{1}{2}$ feet high, erect, dark green, 10 to 20 angled, the ridges with two rows of tubercles or short crossbands, the former predominating; grooves with irregular rows of rosettes; sheaths entirely black or with a narrow ashy band which is broader the second year; the leaves plainly 4 angled through the grooving of the central ridge; teeth persistent or becoming broken in age, rigid, erect, dark brown or black, grooved in the center, with narrow white margins and usually deciduous filiform tips. Somewhat resembles a robust *E. trachyodon*, which it is quite near.

Type European. British Columbia, near Wharnock Station, *A. J. Hill*; Vancouver, *Macoun* (as *ramosissimum*); Blacktail Deer Creek, Yellowstone Park, *Knowlton*. The latter is quite peculiar in appearance and approaches *robustum*. None of the specimens exactly agree, but will come here better than elsewhere. *The Ames Botanic Laboratory, North Easton, Mass.*

THE SPECIES-CONCEPTION AMONG THE TERNATE BOTRYCHIUMS.

BY WILLARD N. CLUTE.

Living as I do in the midst of a region rich in specimens of the ternate *Botrychiums*, I have taken more than ordinary interest in the discussion of the relative rank to which the various forms should be assigned. After considerable study of the subject which has consisted of a careful balancing of the degree of differentiation in each form, as well as an examination of much material both in the herbarium and in the field, I have come to certain conclusions which I purpose to set down here.

Before the separate forms are discussed it may be well to say a few words on the variations of *Botrychium ternatum* in general. It is a noticable fact that all the so-called new species of this section of the genus, have been based primarily upon the cutting of the sterile part of the frond. This is all the more remarkable since there are probably no other genera in which species are founded on the minor outlines of a mere leaf. One has but to turn to nature in any clime to see that leaves are not invariably of the same shape. Note the wide variation in the moonseed, the hollyhock, the sassafras, and some of the buttercups among flowering plants, and if it be contended that the cases are not parallel, take as further illustration the blood-root, which, like the *Botrychium*, produces but one leaf a year, and note the cutting of its single leaf. If all these forms of *Botrychium* are species, why have not the forms of the bloodroot been segregated? Moreover, if we are to recognize these forms of *Botrychium* as species, why should we not also recognize as such the three hundred forms of *Athyrium filix-foemina*, or the hundred or more forms of *Scolopendrium*? It is unavailing to say that these latter are mere gardeners' varieties, for we have it on the authority of Mr. Druery, who is familiar with them all, that a large number come true from spores.

Experiments with flowering plants have shown that the thickness of leaves and the amount of cutting of their edges, may be altered by different degrees of moisture, sunshine, etc., to which they are exposed, and we may infer as much for the ferns.

This being so, it is not difficult to account for the slight variations in cutting exhibited in plants from widely separated points in the United States.

It is, of course, possible to follow the latest writer on the subject, and consider each extreme of variation a distinct species, but I do not agree with him in the opinion that the naming of varieties is a stupid practice, nor do I see that it necessarily follows that because a species was named *Japonicum* from Japanese specimens that we must infer that its centre of distribution is in Japan. As I understand it, to take a familiar example, *B. ternatum* stands for a plant possessing certain characters no matter where found. If we should find another *Botrychium* that differed from this in some specific way, it would be correct to call it another species; but if it showed minor differences, slightly thicker or thinner leaves, a longer or shorter stipe, a little deeper notching of the leaves, etc.—all characters that vary with the locality—then it would seem more properly referred as a variety of the first species.

As I have noted in this journal there are certain slight differences between the Japanese *B. ternatum* and our familiar species of Eastern America, but these are not enough, I now believe, to make them two separate species, since all the differences are found in the texture and cutting of the sterile part of the frond. Under such circumstances I would arrange our American forms as follows:

BOTRYCHIUM TERNATUM OBLIQUUM (*B. obliquum* Muhl.) The common form in the North Atlantic States.

B. T. OBLIQUUM forma DISSECTUM (*B. dissectum* Spreng.) An exact duplicate of the preceding form in everything except the cutting of the pinnules. These latter characterized by a paucity of tissue between the terminal veins. Has the same habitat and range, and the same peculiarity of waiting until July or later before putting up its leaf for the season. No more entitled to specific rank than the "cut leaved" birch or elder.

B. T. OBLIQUUM forma INTERMEDIUM (*B. obliquum intermedium* Unde.) I would call this a mere form, comparable to any of the chance varieties of *Athyrium filix-foemina*.

B. T. OBLIQUUM forma COULTERI (*B. Coulteri* Unde.). A

western form rather more fleshy than that of the East. Grows in geyser formations which may account for the difference in its appearance.

B. T. OBLIQUUM forma OCCIDENTALE (*B. occidentale* Unde.). Closely related to the preceding, and, in my opinion, a phase of it. Both good representatives of the western form.

B. TERNATUM ONEIDENSE (*B. ternatum* var. *Oncidense* Gilbert). This, the most strongly marked of the forms in the Atlantic States failed to receive a place in the recently published index to the described species of *Botrychium*. It can be distinguished at a glance in field or herbarium by its broad and slightly divided pinnules, and is very common in central New York. The fronds, notwithstanding their broad pinnules, are among the smallest of the group. If any of our forms of *Botrychium* are entitled to sub-specific rank, this is certainly the one.

B. TERNATUM SILAIFOLIUM (*B. silaifolium* Presl.). This is also mainly a western form. To it, however, I would refer the plant recently described by Mr. Gilbert as *B. obliquum Habcreri* from central New York. I have examined the type specimen and in my opinion it agrees perfectly with specimens of *silaifolium* from California identified by Dr. Underwood. Even the striations produced in the pinnae by drying appear identical. I should call this a sub-species, as it does not approach the type as closely as the others.

So little is known about *B. biternatum* Unde. and *B. tenuifolium* Unde. that I shall not attempt to place them. Judging from what I have seen of the latter, and I have seen numerous plants in the field, I should consider it a form of *obliquum* and I suspect that *biternatum* will prove to be based upon aberrant plants of this which have fruited in spring instead of autumn. In regard to this, Mr. W. W. Ashe has recently informed me that many spring-flowering southern plants do not flower in the North until late summer. It is possible our ferns may have similar changes in their fruiting season,

NEW FORMS OF FERNS.

BY CHARLES T. DRUERY, F. L. S.

The editorial note appended to my short article in the April issue of THE BULLETIN rather takes my breath away, as I never imagined that an answer to my query could "depend somewhat upon whether we admire ferns for pure leaves or whether we collect them for study." No true fern lover in either case would knowingly destroy one of Nature's own novelties in the way I described by denuding it repeatedly of its fronds for herbarium purposes in situ, when by removing and cultivating it he could also, in either case, not only gratify his own special taste more fully, but could afford much gratification to a host of other fern lovers of either class. That "students of ferns know that many fern forms are due to varying conditions of soil, light, moisture, etc., and are inclined to pay very little attention to them" I accept at once, ranking myself with them; but advanced students also know that many forms are not demonstrably due to such influences, and amongst these forms are all those which claim so much attention in this side of the ocean. The former are, as the editor puts it, "variants," the latter true varieties, and so far as they are of Nature's own shaping, i. e., wild finds, as distinct from improved selected types from the spores, they have at least as much right to recognition in fern literature as the normals. Hence it is to be regretted that a unique form of the Christmas fern (*Polystichum acrostichoides*) should exist in the possession of a member of the Fern Chapter for ten years, and, yet, never be described. What have the other members done that such interesting data to some of them should be withheld?

The reference to seven-toed kittens and two-headed rabbits, as fair parallels to the finest fern varieties in the mind of the average student, is a poor compliment to the student who would certainly benefit by a better acquaintance with the plumose section of varieties at any rate. With the many botanists stated to exist in the States who "prefer a wild rose to all the gardeners' many-petalled creations" I have more sympathy, but here comes in the old botanical mistake embodied in the term "garden forms"

of ferns as applied to all varieties, with the wild finds of which the gardeners have had nothing whatever to do. What would such a botanist do if in his rambles among the wild roses he came across a Marechal Niel as a wild sport? That is a fair parallel to some of our best wild finds as compared with the normal types, and he would be a singular man, I opine, in more senses than one, if he turned up his nose at it as a mere variant and held his tongue for ten years without describing it. I am gratified to the editor for holding all his abnormal specimens at my disposal, but, reading between the lines, I fear they would embrace no acquisitions from my point of view, or he would not be so ready to part with them. I hope sooner or later he will come across a thoroughbred and become thereby a convert to my theory, that constant and symmetrical variations are fully as much, if not more, entitled to both lay and scientific attention than the normal specific forms from which, by some occult process, they arise under natural conditions.

[It is doubtless as difficult for Mr. Druery to understand our position in this matter as it is to understand his. How a *student* of ferns can care for what might be termed abnormal variations is beyond our comprehension. The student is always interested in normal variations, if we may so describe the common, slight variations in form and texture due principally to ecological factors; in fact, it is necessary that we take all such into account in order to get a correct average of the species; but to give serious attention to forked, crested, plumed, tasselled and befrizzled specimens of ferns, which are manifestly due to the slipping of a cog somewhere in Nature's machinery, is quite out of the question. We grant that some of these attain forms that merit admiration for their beauty, or oddity, as showing what Nature can do in the way of leaves, but we maintain that were these forms animal, instead of vegetable, they would excite only feelings of repulsion. Now, the student of fern species is quite inclined to think of these "freaks," as he calls them, much as others would if they *were* animal. The botanist may admire the form, hue and perfume of the gardener's rose, but this is not the rose he cares to study. In the early numbers of THE FERN BULLETIN, upward of sixty American ferns have been put on

record as bearing forked or tasselled fronds, and so far as the editor is aware, not one of these has been taken into cultivation and only a very few have been given names. This fact will probably explain our position to some extent. When the editor has leisure, he is going to dig up every one of these variants in his own locality and send them to Mr. Drury, in anticipation of which it would be well for the latter to consult his gardener and glazier about an extension to his ferneries.—ED.]

FERNS IN BOTTLES.

A correspondent sends us the following clipping from the *Westminster Gazette*. We are unable to vouch for its accuracy, but as it may give some cultivator a hint we reprint it in full.

In a beautiful garden at Crouch End, belonging to one of the few old world bowers which have withstood the tempting offers of the building speculator, may be seen one of the queerest freaks that Nature has ever played in park or garden. About three years ago a long row of glass ginger bottles were placed neck downward in the ground, with a few inches of the other end projecting to form a border for the kitchen garden paths. Each of these bottles now contains a fairy-like resident in the shape of a dainty little fern, perfect in form and color, and of many varieties, the ribbon fern and hart's-tongue predominating. As no ferns had at any time been planted in that part of the garden it is amazing how they got there. Perhaps Nature thought it foolish to waste so many little natural hothouses, and put in each a pinch of the stuff she makes ferns of. If so, she must view with much pride the result of her experiment.

Miss Angie M. Ryon, Niantic, Conn., reports finding fine plants of *Ophioglossum vulgatum* upon a very rocky hillside, the roots crowding themselves between the bits of rock that had been broken up by loads of heavy timber passing over them the previous year. The plants were exposed to the full rays of the sun for most of the day.

WILLIAM RALPH MAXON.

William Ralph Maxon, whose portrait is presented this month, first saw the light at Oneida, N. Y., on Feb. 27, 1877, where his parents reside. He graduated at Oneida High School in the class of 1894. From there he went to Syracuse University, where he took the degree of Ph. B. in 1898. The bent of his mind was toward botany and almost immediately after graduating he went to New York and was employed for a few months in the herbarium of the Botanical Garden at Bronx Park. From there he went to Washington and took a temporary position in the U. S. National Museum. But in August, 1899, as the result of a Civil Service examination, he received the appointment of Aid in Cryptogamic Botany in that institution, and still retains that position.

Mr. Maxon joined the Fern Chapter in 1895, served as its secretary for the year 1899, and as president of the Chapter for the two years 1900 and 1901. He is a member of the Botanical Society of Washington, of the American Association for the Advancement of Science, and of two other local societies in Washington. He has published several valuable papers on botanical subjects, among which are "A List of the Ferns and Fern Allies of North America north of Mexico;" "On the Occurrence of the Hart's-tongue in America," which formed his presidential address before the Fern Chapter at its meeting in New York in 1900; "A Study of Certain Mexican and Guatemalan Species of *Polypodium*"; besides several shorter papers containing descriptions of new species, including a continued series in the *FERN BULLETIN* entitled "Notes on American Ferns." For a young man Mr. Maxon has done some notably good work, and his position in the National Museum is one which will give him exceptional opportunities for original work in the future.

—B. D. Gilbert.

ANOTHER STATION FOR *ASPLENium EBENEUM* HORTONAE.

It affords me much pleasure to report another station for the remarkable fern now known as *Asplenium ebeneum Hortonae*.

A single fine specimen some eight or ten inches high was discovered by Miss K. A. French at the base of a ledge in Pittsford, Vt. No sign of fertility is discernable in the old fronds decaying about the base, the season's growth or the newer fronds stretching up indoors. Whence came this beautiful variation in the midst of type specimens galore?—G. A. Woolson, Pittsford Mills, Vt.

INDEX TO CURRENT LITERATURE RELATING TO FERNS.

Readers are requested to call our attention to any omissions from this list.

CLUTE, W. N. *Fernwort Notes—III*. Fern Bulletin, Jl. 1903.

CHRIST, H. *Can Scolopendrium Lindenii be Separated From S. Vulgare?* Fern Bulletin, Jl. 1903.

EATON, A. A. *The Genus Equisetum in North America*. Fourteenth Paper. Fern Bulletin, Jl. 1903.

FITZPATRICK, F. J. and M. F. L. *The Fern Flora of Iowa*. Fern Bulletin, Jl. 1903.

FLETT, J. B. *The Fern Flora of Washington*. Fern Bulletin, Jl. 1903.

GILBERT, B. D. *Asplenium muticum*. Fern Bulletin, Jl. 1903.

GILBERT, B. D. *Two New Varieties of the Ternate Botrychium*. Fern Bulletin, Jl. 1903.

HAESSELBARTH, F. C. *The Walking Fern*. American Botanist, Jl. 1903.

ORCUTT, C. R. *Ferns of Southern California*. West American Scientist, Ag. 1903.

ORCUTT, C. R. *Isoetes of Southern California*. West American Scientist, S. 1903.

SHULL, C. H. *Geographic Distribution of Isoetes Saccharata*. Botanical Gazette, S. 1903.

STILLMAN, B. W. *The Climbing Fern*. American Botanist, Je. 1903.

EDITORIAL.

The editor of this journal is again away from home, which will explain any delays in his correspondence. Letters intended for him and sent to the usual address will be forwarded at once.

* * *

Every time the FERN BULLETIN is late, doubtless half the subscribers wonder what the editor can be doing to prevent the magazine from appearing on time. The editor, therefore, rises to explain that this publication would always be issued promptly if correspondents would send in copy in season. We endeavor to have each issue ready for the printer *a month before publication*, and yet there are many of our contributors, who, having arranged for space in a number, will wait until two or three days before the publication date to send in copy. There is too much matter in the FERN BULLETIN for it to be printed, bound and mailed in one day—or in one week for that matter—and we simply cannot appear on time if we have to wait for copy. We trust that contributors will bear this in mind and co-operate with us in future in this matter of promptness.

* * *

In this number, all subscribers whose subscriptions are not paid in advance, will find a bill for the next volume, and the amount in arrears, if any. There are so few who stop their subscriptions after once becoming members of the FERN BULLETIN circle of readers that to save all from the possible loss of a number between the expiration and renewal of subscription, we continue to send the magazine until ordered to stop. Those who do not wish to be considered subscribers for the new volume should notify us at once. In view of the liberal terms upon which the publication is sent, we trust that we may continue to count all our present subscribers among our readers for another year.

* * *

The new volume of this magazine will be along the lines of its predecessors. The Fern-floras of the States will be continued, those for California and Florida being expected to appear early

in the year, followed by others now in preparation. The series of portraits of fern students will be discontinued for the present, to make room for a new series on exotic ferns in which will be illustrated the ferns of unusual appearance from other lands, together with descriptive notes upon their haunts and habits. In nearly every fern collector's herbarium are species of which little more than the name is known. It is expected that this series will add much to our knowledge of these. Mr. Eaton's *Equisetum* articles will be finished during the year. Other features of the publication will be continued. A cordial invitation is extended to every reader to contribute notes and articles of interest.

* *
*

When one's herbarium has grown so bulky that it cannot be looked through in an hour or so, and especially when it contains numerous sheets of the same species, it often becomes a puzzling question what to show the non-scientific visitor who wants to see the ferns, but who has no interest in the slight differences that separate closely related forms. To fit such cases we would suggest the formation of an "oh, my!" collection—a collection designed to provoke the visitor's interest and admiration and draw forth frequent ejaculations of surprise. Such a collection saves wear and tear on the general herbarium and often excites a real and lasting interest in the ferns. It should contain, of course, the walking and climbing ferns, the little *Schizaea*, the hartstongue, the maidenhair, the cinnamon and sensitive ferns, etc. Some of the gold and silver ferns might be included, the star fern is desirable and various species of grape fern will add to the interest. A few finely cut fronds like that of *Dicksonia* may be added, with such other species as suggest themselves on account of oddity in fruiting. A few fern allies would make a complete and desirable show herbarium.

* *
*

The recent likening, in this journal, of crested and tasseled fronds to two-headed rabbits has borne fruit in an unexpected quarter. Certain cultivators of ferns now speak of their stock as species, varieties and two-headed rabbit sorts!

In a recent article on the distribution of *Isoetes saccharata*, in the *Botanical Gazette*, the author notes that *I. saccharata* is found only in Chesapeake Bay, while *I. riparia*, a form that closely resembles it, is found only in Delaware Bay, and that, notwithstanding the small differences between the two, there have been described two intermediate forms, *I. saccharata Palmeri* and *I. s. reticulata*. From this and other facts, he inclines to the belief that *I. riparia* is simply an extreme form of *saccharata*. A curious circumstance connected with the species and forms is that specimens collected in a certain locality appeared one season as the type and the next as the variety. This is not the only instance on record of *Isoetes* species intergrading. Mr. A. A. Eaton has noted that the variety *Californica* of *I. melanopoda* intergrades on the one hand with *I. Howelli* and on the other with the type, while specimens referred to *I. mexicana* by Underwood have since been identified as *I. Orcutti* and *I. melanopoda*. All this seems to indicate that the systematists have not yet got hold of the proper characters upon which to found specific differences, and there is here a chance for a philosophical botanist to distinguish himself. It is not enough that the plants look different; the differences must be specific. All of the forms of *Equisetum avense* look different, but they are not species by any means.

* *
* *

Plans are being made for another meeting of fern students at St. Louis this winter, during the session of the American Association for the Advancement of Science. There is a prospect of some excellent papers to be presented, and a large and enthusiastic meeting is assured. Programs and other information may be obtained of Prof. N. L. T. Nelson, Central High School, St. Louis, Mo., or of the editor of THE FERN BULLETIN. The editor expects to be at the meeting and hopes to meet there the majority of his readers.

BOOK NEWS.

With two books like "Our Ferns in Their Haunts" and "How to Know the Ferns," in the field, some might think that the ground is too thoroughly covered to leave room for another,

but Dr. Waters has proven otherwise in his new volume with the simple title of "Ferns,"* If the older books are taken as books designed for beginners, the new one may be described as one step more technical—a connecting link between popular handbook and scientific manual. In the matter of information it contains practically nothing that has not been published before, being primarily a rearrangement of what is known of our ferns and bearing internal evidence that the pages of the popular works above mentioned have supplied much help in its making. This is especially noticeable in the appropriation of original stanzas from "Our Ferns in Their Haunts," without giving credit for them. Even when giving credit the author is not always fortunate, as when he ascribes to Miss Pratt certain lines that are Campbell's. The book is written from the standpoint of the author's experiences in the vicinity of Baltimore, and as such cannot always be taken as representative of ferns and fern habitats in other parts of our country. The book is also remarkable for the entire absence of author citations for the generic and specific names—in this being unique among American fern books. This will make it difficult for beginners who use this book to look up the species elsewhere. The entire subject of the authority for the names is left untouched in the part that explains why scientific names are used. There is also evident a disinclination to give credit for recent work, the usual statement being that such and such varieties "have been described," without noting where and by whom. Since these descriptions were heretofore to be found mostly in periodicals, the desirability of mentioning their place of description is apparent. This much being said in criticism of the book, there is yet much to praise. The illustrations are well executed and include a fair proportion of views in the habitats of the ferns, while the photographs of the sori enlarged are exceptionally valuable. Anything like them have never before been published. The analytical key based on the stipes has been well and carefully worked out. It forms a very instructive chapter, though such a key will rarely be consulted by the beginner, because the usual keys are easier. The book

*Ferns. By Campbell E. Waters. New York. Henry Holt & Co. 1903. 8 vo. 360 pp. \$2.75 net.

is also of interest for the number of varieties or forms included, many of which are not mentioned in the manuals, and for numerous photographs illustrating these forms. There is also a chapter on fern photography. The nomenclature is conservative; old and well known names having been retained in spite of recently proposed substitutes. For his stand in this matter the author is to be greatly commended. The book can in no sense be considered a rival of others in the field. It fills a place of its own and as such will be hailed by the fern loving public as another aid to the proper understanding of this most beautiful and attractive section of the vegetable kingdom. Type, paper and presswork all combine to make this a handsome as well as useful book.

In the making of his "Flora of the Southeastern United States"† Dr. Small has practically worked over anew all the species of that region and the results of this stupendous undertaking are now presented in a bulky octavo volume of nearly fourteen hundred pages. Dr. Chapman's flora of the same region is fairly conservative, while this one goes to the opposite extreme, being noticeable for the greatly increased number of species and an equal lack of what the older book is inclined to consider varieties or forms. This gives students a choice of books, but it is probable that a beginner will have much difficulty in identifying his plants by the aid of the new one, because of the many closely related forms described as separate species. The book will appeal more to advanced students specializing in a few orders or genera. The nomenclature is, of course, the most radical, even extending beyond the genera and species to the orders, so that new names are proposed for the Leguminosæ, Labiatae, Scrophulariaceæ and many others. Along with the segregation of species there has been a similar splitting of genera. To the individual familiar with the usual manuals the book will appear almost like the flora of a foreign land. The author, however, has been painstaking and conscientious throughout the work, adhering closely to the ideals prevalent at New York and a few other centers of botanical activity, and if

†The Flora of the Southeastern United States. By John K. Small. New York. Published by the author. 1903. 8 vo. 1,375 pp. \$3.60 net.

he has produced a volume that will become the object of much criticism he has also produced an excellent illustration of what the recently proposed rules of nomenclature, and new conceptions of species are capable of when allowed full swing. Although not agreeing with his conclusions, even conservative botanists will appreciate the author's consistency and he is to be congratulated upon the completion of his work. To those who prefer the less elaborate manual, Dr. Small's book will always be indispensable for reference.

Mr. Charles T. Druery, well known on this side of the Atlantic as an enthusiastic cultivator of ferns, has issued a book devoted principally to British fern varieties, which he has named "The Book of British Ferns."* In this work he has been assisted by various members of the British Pteridological Society, an association similar to our Fern Chapter, and of which Mr. Druery is president. As is well known the British fern hunter and fern cultivator is most interested in the abnormal forms of ferns, and as a result so many of these have been described that a complete list numbers more than a thousand, though there were less than seventy-five native species to begin with. Mr. Druery's task has been to select from this list the really meritorious varieties from the cultural standpoint. To this revised list he has added papers on the culture and propagation of ferns, fern hunting, fern crossing, apospory and kindred subjects, making a volume which should be of interest to American readers for the light thrown upon fern life. The book is well printed and well illustrated, the forms shown being mostly the more striking varieties.

*The Book of British Ferns. By Charles T. Druery, F. L. S., V. M. H. London. George Newnes, Ltd. 1903. 12 mo. 135 pp. \$1.25.

A WORD FROM THE EDITOR

For more than two years the editor of the *FERN BULLETIN* has also been editing a journal for the plant-lover called THE AMERICAN ROYALIST. That he has been fairly successful may be assumed from the fact that it now has two large circulations—evidence of any botanical magazine in America. People do not buy such publications without realizing they buy them for what they contain. No doubt the principal reason for the AMERICAN ROYALIST's popularity is that it is interesting—even those who are not botanists can understand it. Moreover it deals with a very different class of readers from those usually presented. If you are interested in plants as living things—their uses, habits, and various methods of getting on in the world—this is for you the publication you want. A large number of fern students are already readers of the AMERICAN ROYALIST, but to induce others to become such, we offer the last three numbers for this year, all the numbers of next year for the regular subscription price of \$1.00 if received before the first of January. Or we will send the first five volumes of the magazine FREE and a year's subscription for \$1.00. With the latter offer, your subscription to the FERN BULLETIN will be renewed for 50 cents additional.

Address WILLARD N. CLUTE, BINGHAMTON, N. Y.

For Christmas

Nearly every fern student seems to have a copy of "Our Ferns in Their Haunts," but if you happen to know of one who doesn't, you could scarcely do a more graceful thing than to give him one for Christmas. You may be sure the book will be consulted many times next year and in the years to follow and every time this happens the giver will be thought of with pleasure. If you have a young friend who is beginning to get interested in Nature, crystallize his tendency by giving him this book. The illustrations will make him a lover of ferns and the text will make him wise about them. There are 225 illustrations and 340 pages of text. No other fern book is so full, so clear or more accurate. The key for identifying the ferns has illustrations the of fruit-dots and even a child can name the ferns by its use. Sent postpaid upon receipt of \$2.15. Address

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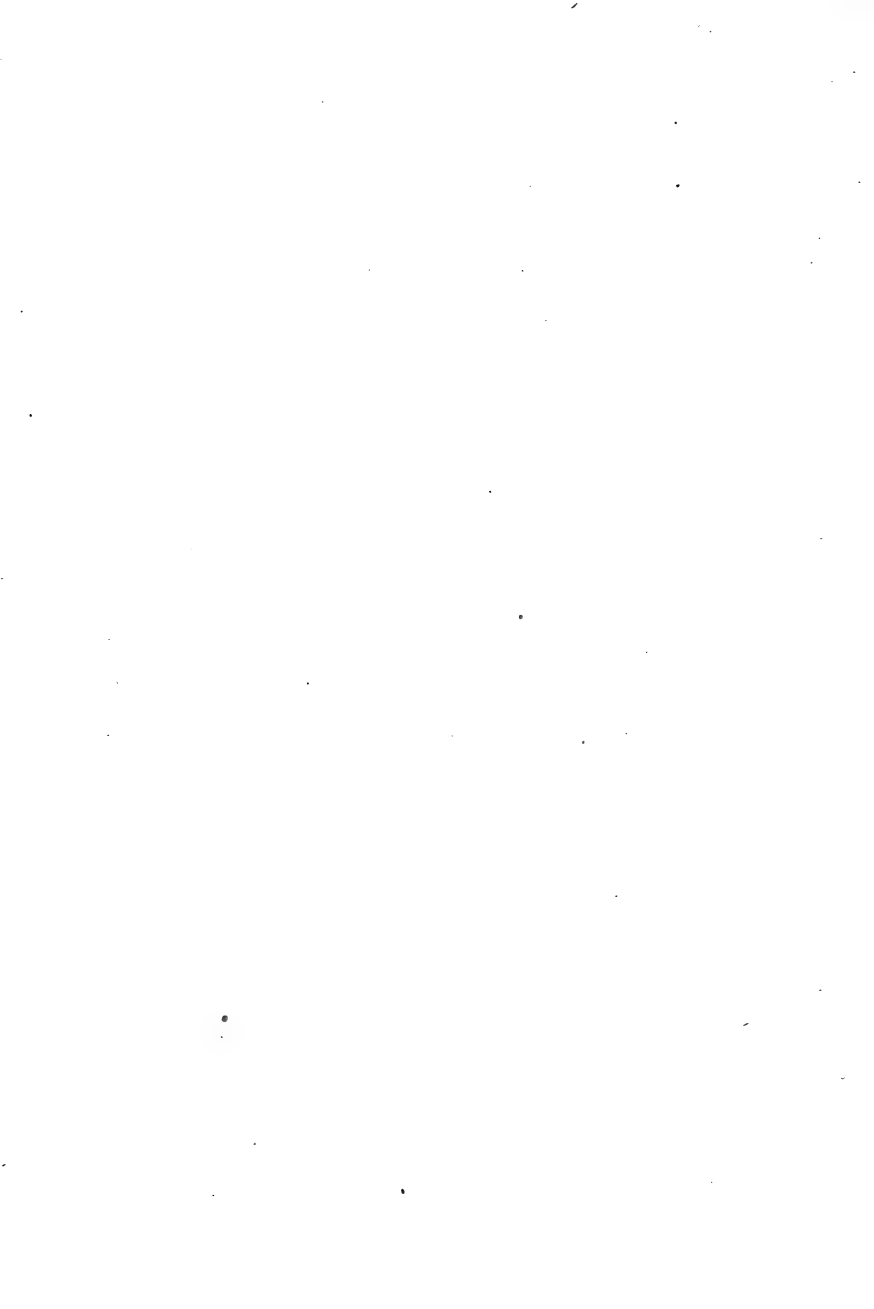
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A Quarterly Devoted to Ferns.

JANUARY

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THE FERN BULLETIN

A QUARTERLY DEVOTED TO FERNS

WILLARD N. CLUTE, Editor

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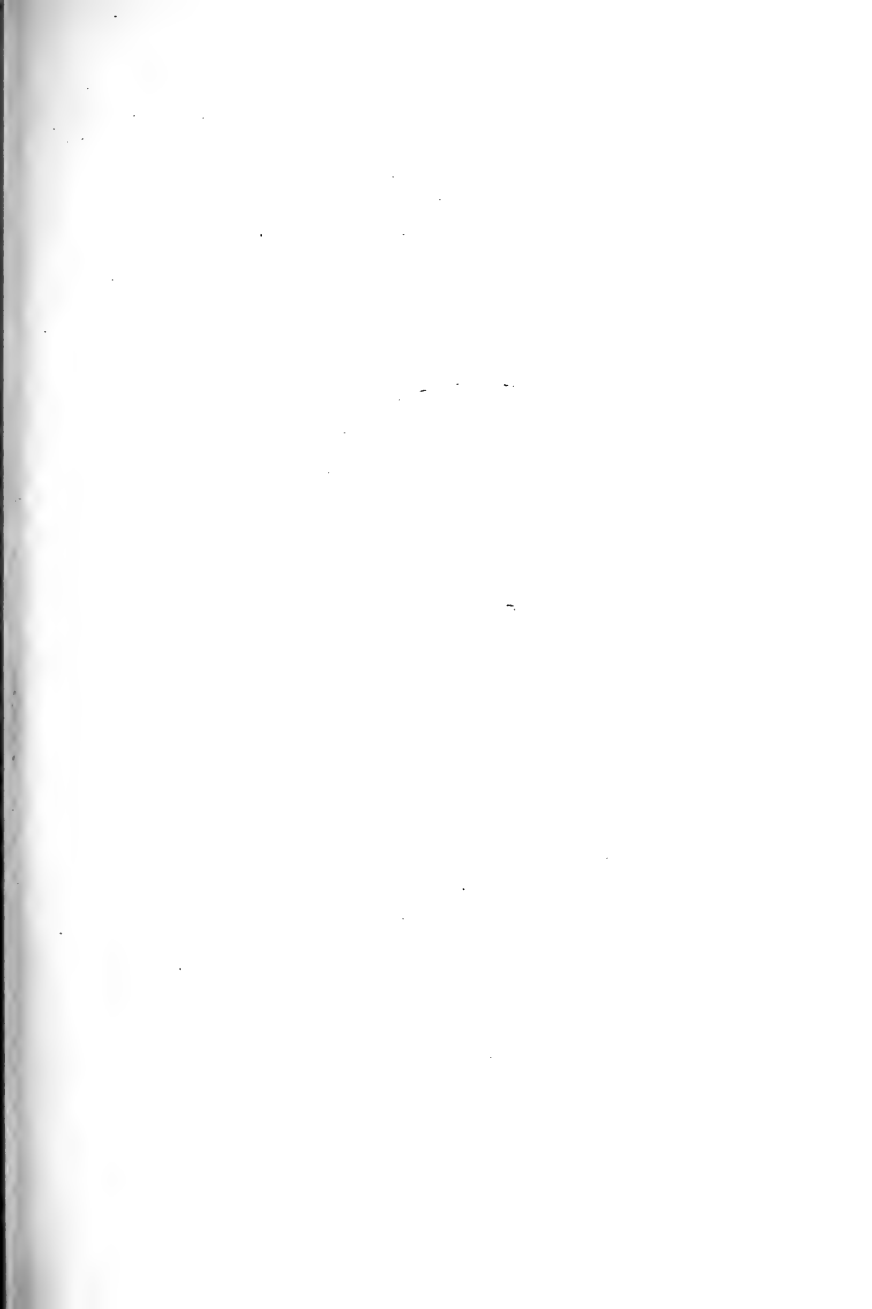
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WANTED—The undersigned, being interested in California ferns, would like the address of every fern student in California. Address DR. R. J. SMITH, Mentone, San Bernardino County, Cal.





SARAH FRANCES PRICE.

THE FERN BULLETIN

VOL. XII.

JANUARY, 1904.

NO. 1

THE FERN FLORA OF CALIFORNIA.

By S. B. PARISH.

For six hundred miles, from north to south, California, long and narrow, faces the Pacific; but its breadth is but two hundred miles. An area on the Atlantic coast, correspondingly bounded, would extend from Boston to Charleston, but inland only to Ithaca.

But by reason of the differences of altitude the narrower dimension offers greater climatic variations than are due to the prolongation in latitude. One considerable range of mountains follows the coast, and further inland the Sierra Nevada lifts its lofty summits 10,000 to 14,000 feet above the sea. Both at the north, and at the south, these ranges coalesce; between them they embrace a great central valley, drained by rivers which find a common outlet through the Golden Gate.

There is as great variance in this territory in respect to the amount of precipitation. Along the foggy northern coast the annual rainfall is from thirty to sixty inches; the Sierra Nevada is heaped high with snow in winter, and in summer frequent showers keep fresh its Alpine meadows. Everywhere else there is a deficient precipitation, which reaches its minimum in the southern deserts, where the normal is but five inches, and where, in places, the parching atmosphere may, for a twelve-month, be unalleviated by a single drop of rain. Temperature shows as wide a range, from peaks congealed in perpetual snow, to sheltered nooks where frost is never known.

Here exist, then, in great diversity, and in varied combination, the conditions—temperature and precipitation, latitude and altitude—which should produce a greatly diversified flora. It is distinctly disappointing to find in this great area, with such varied climatic conditions, no more than 50 ferns, or, including the fern allies, 76 filicoid species. Compare this, not with a fern paradise, such as the Island of Jamaica with its 500 species,

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but with New Jersey, smaller than single counties of California, and with a comparatively homogeneous surface and climate, but which includes in its flora 39 ferns and 27 other fernworts—but 10 less than are found in this great State.

It appears, therefore, that the conditions in California do not conduce to the development of an extensive fern flora. The ferns are a tropical family, and flourish best where a moist atmosphere is combined with an equitable warmth. The atmosphere of the northern coast is sufficiently moist, but the temperature is low. As a result there is a great abundance and a luxuriant growth of ferns, but they are confined to a few species, mainly, indeed to a single one, the cosmopolitan bracken.

The atmospheric aridity elsewhere is too great, and only xerophytic ferns can exist, save for a few species which are closely confined to the immediate vicinity of water. The numerical abundance of individuals, as well as the multiplication of species, is of those ferns which, by the minute subdivision of their leaves, by their habits of vegetating, by the possession of hairy, scaly or powdery induments, usually by the union of more than one of these devices, are able to flourish with scanty and irregular supplies of water. Accordingly *Pellaea*, *Notholaena* and *Cheilanthes* are the genera which have the greatest development.

Space does not permit an extended discussion of the distribution of the fern flora. It is determined by the action of the same causes which have disposed the general flora of the State. Disregarding minor modifications, the essential consideration is the interrelation of the two great life-currents which here meet and interpenetrate. From the north comes a number of boreal ferns, some of them barely passing across the boundary, others following for certain distances down the coast; while the most important line of descent is along the high altitudes of the Sierra Nevada. By this route such a northern plant as *Cryptogramme acrostichoides* nearly attains the southern boundary, and *Woodsia Oregana* passes over it into Lower California and Arizona.

On the opposite hand, from the southeast come ferns of the Sonoran type, most abundant in the south, but in some cases passing well to the north, as is instanced by *Gymnogramme triangularis*, which reaches British Columbia. It is mainly in this

group that those ferns are found which are distinctively or exclusive Californian, and which are the most interesting and characteristic.

In the following list I am able, from personal knowledge, to speak with some accuracy of the distribution of the ferns in the southern counties. For the rest I have been obliged to rely on published statements, on the examination of collections, and on the kind assistance which has been given me by several valued correspondents. Printed authorities are few, and in many ways unsatisfactory. Eaton's elaboration of the pterodophytes in the Botany of the Geological Survey, although published twenty-three years ago, is to-day far the best—I may say is the only valuable presentation we have of these plants. The distribution of the species is given as accurately as the knowledge then accessible permitted. Since that date, besides general works, as those of Underwood, Gilbert and Maxon, two papers on western ferns were published in 1882—Lemmon's Ferns of the Pacific Coast, and Jones' Ferns of the West. But the scope of all these papers permits, for the most part, only general statements, the whole State being regarded as a unit in the definition of distribution. There are but two or three local lists in which the ferns are enumerated. They are entirely ignored in the two manuals recently issued for central California—Greene's Flora of the Bay Region, and Jepson's Flora of Western Middle California.

The present list is, then, to a considerable degree, merely tentative. But so far as it goes, it is thought to be correct. For in no case is a limit stated unless upon what is believed to be good authority. It is altogether probable, therefore, that in some instances the actual limits of species are under stated. But this appears preferable to risking an over statement, even on the most probable conjecture. When a general statement is made, as that a certain species occurs "throughout the State," it is always to be understood that the desert region is excepted, unless it is expressly included.

In the preparation of the list I have been greatly aided by valuable notes obligingly communicated by Mrs. N. L. Britton, Miss Alice Eastwood, Mr. A. A. Eaton, Prof. A. W. Evans, Mr. B. D. Gilbert, Mr. W. R. Maxon, and Dr. L. M. Underwood, whose kindness I take this opportunity of acknowledging.

OPHIOGLOSSACEÆ.

Ophioglossum Californicum Prantl. Discovered in January, 1850, by Dr. C. C. Parry, growing in grasses, stony places on the high mesas near San Diego. It remained otherwise unknown until rediscovered at the same place, and by the same botanist, in March, 1882, and has been collected there frequently since. The only other locality where it has been found is at Ensenada, in adjacent Lower California, where it was collected by Jones and by Pringle. It is said not to appear in very dry winters.

—— *Ophioglossum vulgare* L. A specimen of this species is said to have been collected somewhere in California, but its authenticity is doubtful.

Botrychium silaifolium Presl. From Plumas county to the northern boundary of the State. A specimen collected near Sisson by M. A. Howe is stated to have grown "in swampy woods" at about 3,500 feet alt.

Botrychium simplex E. Hitchc. At high altitudes (10,000 feet) in the Sierra Nevada; probably in the northern part only.

—— *B. Coulteri*, *B. lunaria* and *B. Virginianum* have been reported from California, but probably incorrectly.

POLYPODIACEÆ.

Polypodium vulgare L. Near the coast, from San Francisco northward; sometimes growing on the trunks of trees.

Polypodium hesperium Maxon. Probably occurs, at high altitudes throughout the entire length of the Sierra Nevada. In the San Bernardino Mts. it is found at an altitude of about 9,000 feet, or, under exceptional circumstances, as low as 6,000 feet. It grows in the crevices of rocks.

Polypodium falcatum Kellogg. This fern has been collected in Trinity county, which seems to be its southern limit. Northward it extends to Alaska. It grows on tree trunks, or in rock crevices.

Polypodium Californicum Kaulf. This species apparently reaches us from the south. It has been collected on the peninsula of Lower California by Brandegee, and on Guadalupe Island by several botanists, while Gilbert has received it from Costa Rica. It is especially abundant in the southern part of the State, and while its northern boundary is uncertain, it probably does not reach the Oregon line. The most northern specimen to our

knowledge is from Amador county. Its usual place of growth is in rock crevices, but rarely it is found in soil.

Polypodium Scouleri Hook. and Grev. In the redwood belt of the coast, from Santa Cruz county north to Vancouver. It has also been collected on the islands of Santa Cruz and Santa Rosa and on the Mexican island of Guadalupe. Usually it grows on the trunks of trees, but sometimes among rocks.

Gymnogramme triangularis Kaulf. Common at low altitudes, from Cape San Lucas, Lower California, to British Columbia. The more robust form, having fronds coated with yellow powder, is the commoner. This is commonly known as the golden fern. The form coated with white powder is called the silver fern. This form even reaches the borders of the Colorado desert, at Palm Springs. The variety *viscosa* Eaton, characterized by its more contracted and less divided fronds, which are viscid, and either yellow or white powdered, is confined to the coast mountains of San Diego County. It has been proposed recently to raise it to specific rank. These ferns grow in loose, stony soil, on shaded hill sides. The gold and the silver forms usually do not grow together.

Notholaena Newberryi Eaton. COTTONY FERN. Abundant in crevices of rocks, and about their bases, in the hills of the coast mountains, up to 1,000 feet alt. First collected by Professor Newberry, whose name it bears, in San Diego. Apparently it does not extend north of Los Angeles. San Bernardino is its inland limit, except for a recent collection by Brandegee, at Providence Mts., in the desert region. In Lower California it has been found on Guadalupe Island, and may be expected on the peninsula.

Notholaena Parryi Eaton. A species of the desert region of Southern California, thence extending to Maricopa in Arizona, and to southern Utah, where the type was collected in 1874, at St. George, by Dr. C. C. Parry. It is found as high as 3,000 feet alt., but is more abundant at lower altitudes, as at Palm Springs, 500 feet alt. It grows at the base of rocks or in their crevices.

Notholaena cretacea Leibm. Rare and local in Southern California. The only stations known to me are the vicinity of San Diego, Palm Springs in the Colorado Desert, and Slover Mt., near San Bernardino—the latter being the northern and western limit of the species. It also extends well down the peninsula of Lower California. Its habitat is the crevices of rocks, or the soil at their

bases. The white-powdered and the yellow-powdered forms usually grow intermixed. The Palm Springs specimens are larger and more vigorous than those from either of the other stations.

Notholaena tenera Gillies. An exceedingly rare and local fern of the southern desert region. First found in North America in 1874 by Dr. Parry, in the Beaverdam Mts., of southern Utah. It has been collected since by Parish on the desert side of the San Bernardino Mts., in 1882; in Arizona in 1884, on the Colorado river, by Lemmon; at Palm Springs in the Colorado Desert, in 1893, by Davidson; and recently by Purpus at Piute Peak in the Mojave Desert, and by Brandegge (1902) in Providence Mts. So far as I am aware, these are the only collections of the fern that have been made in North America, except a somewhat doubtful one reported from the Santa Barbara Mts. It also occurs in Chile. Crevices of rocks are its habitat.

Adiantum Capillus-Veneris L. VENUS' HAIR. Most common in the southern part of the State, extending as far north at least as Santa Barbara, and south into Lower California. It is found on shaded and wet, or commonly dripping, rocks, in the lower mountains, probably not ascending above 3,000 feet alt.

Adiantum emarginatum Hook. Throughout the length of the State; in the south most abundant in the coast mountains, but in central California (Amador county, etc.), in the Sierra Nevada. It has been collected in the desert region by Coville in the Panamint Mts., and by C. F. Saunders at Palm Springs in the Colorado Desert. It is confined to low altitudes, and affects shaded banks, or the base of rocks, in places which are wet during the growing season, but which later become dry.

Adiantum pedatum L. MAIDEN-HAIR. This fern grows in the crevices of shaded rocks throughout the whole length of the Sierra Nevada, reaching in the south 7,000 feet alt. Northward it is said to grow also in the Coast Range.

Pteris aquilina lanuginosa Bong. This variety of the cosmopolitan bracken is found, mostly as an undergrowth in open forests, in the mountainous parts of the State, from its northern boundary, whence it passes far to the north, to its southern, and thence southward to the extreme point of Lower California. Often the whole face of the land is covered for miles with it. Along the northern coast it is very luxuriant, growing in dense thickets,

overtopping a man; but southward its more open growth seldom exceeds two or three feet.

Cheilanthes Californica Mett. LACE FERN. A common species of the southern coast mountains, reaching as far inland as San Bernardino, and extending north to Russian river. It affects the base of shading cliffs, in soil which is wet in the growing season, but becomes dry later.

Cheilanthes amoena A. A. Eaton. The type station of this species is Dunlap, in Fresno County, and it has not been collected elsewhere. Mr. Gilbert regards it as a variety of *C. Californica*.

Cheilanthes viscida Davenp. In the southern part of the State this is strictly a desert species, occurring in the shaded crevices of rocks, at low altitudes, in the mountains which form the western border of the Colorado Desert, as at White Water (where first collected by Parry and Lemmon), Morongo, Palm Springs and Vallecito, and also in the Panamint Mts., in the Mojave Desert. It is also reported from Downieville Buttes, in the central part of the State, a station quite incongruous with its southern distribution.

Cheilanthes Cooperae Eaton. Widely distributed throughout the State, but of very local occurrence. Mt. Shasta appears to be its northern limit, and Slover Mt., near San Bernardino, its southern. Mrs. Elwood Cooper, in whose honor it was named, collected it near Santa Barbara, and it has been collected in Amador county by Hansen, and in Mariposa by Congdon. It is found in deep crevices of cliffs or in canyons.

Cheilanthes gracillima Eaton. Growing among rocks in the Sierra Nevada, at 7,000 to 9,000 ft. alt., from the Yosemite to Mt. Shasta, and north to Washington.

Cheilanthes fibrillosa Davenp. This and the next are known only from the type collections. The station is the San Jacinto river at the point where it makes its exit from the mountains of the same name, where it was found growing among boulders in June, 1882, by Parish.

Cheilanthes Parishii Davenp. The specimens from which this fern was described were collected at the foot of a bluff, in Andreas' Canyon, near Palm Springs, on the western border of the Colorado Desert, in March, 1881.

Cheilanthes Clevelandi Eaton. In the mountains of San Diego county, north to Beaumont, Riverside county, and south into

Lower California. Its altitudinal range is below 3,000 feet, and its habitat the bases of sheltering rocks. It is named in honor of Daniel Cleveland, the earliest resident botanist of southern California.

Cheilanthes Fendleri Hook. A species of wide distribution. In the Sierra Nevada it extends from Mt. Stanford to San Jacinto Mt., and in the Coast Range from Lake county to Santa Cruz. and it has been collected on the island of the same name. It occurs also in the mountains of the Colorado and Mojave deserts, extending thence into Lower California and Arizona. Its altitudinal range is from 3,000 to 9,000 feet, and it grows in the crevices of rocks.

——— *Cheilanthes myriophylla* Desv. is usually credited to California, but I have seen no specimens that are not better referred to the preceding species.

Cryptogramme acrostichoides R. Br. A species of high altitudes in the Sierra Nevada. It reaches us from the far north, and is most frequent in the northern part of the State, but it has been collected in the extreme south, at 9,000 feet alt. in the San Bernardino Mts., by Mr. W. G. Wright. This is the southern limit of the species. It also is a rock fern.

Pellaea Breweri Eaton. On exposed rocks, at high altitudes in the Sierra Nevada, from the Yosemite northward into Oregon.

Pellaea andromedaefolia Fee. Common from Santa Cruz and Amador counties south to San Diego. The variety *rubens* Eaton is found in the southern part of the State. It has fronds which when young are somewhat yellowish, and later become bronzy purple or red, a coloration which has been thought to be the result of growth in exposed situations. Both species and variety grow in stony soil in the lower mountains below 3,000 feet alt.

Pellaea brachyptera Baker. A rock-loving fern growing at high altitudes in the Sierra Nevada. Its reported range is from Plumas county northward into Oregon.

Pellaea ornithopus Hook. Common on hills or mountain slopes, below 5,000 feet alt., from Mendoceno to San Diego county, and thence to San Pedro Martir, in Lower California. It commonly grows in clay soil, in the protection of shrubs or stones.

Pellaea Wrightiana Hook. The form of this fern known as var. *compacta* Davenp. is frequent in the San Bernardino and

San Jacinto Mts., growing in stony soil on dry slopes, at 6,000 to 8,000 feet alt.; and it has also been collected by Brandegee in the Providence Mts., in the Mojave desert.

Pellaea densa Hook. A common species in the Sierra Nevada at from 6,000 to 8,000 feet alt., from Mineral King Mt., in Tulare county to Mt. Shasta, and thence northward to British Columbia. It grows in the crevices of rocks.

Pellaea Bridgesii Hook. An apparently rare species of high altitudes in the Sierra Nevada; its range poorly defined. It has been collected at Webber Lake by Lemmon; in Placer county by Sonne; on the Merced river by Kellogg, and in Amador county by Hansen.

—— *Pellaea flexuosa* Link. has been credited to California, but the reference is almost certainly erroneous.

Lomaria Spicant Desv. DEER FERN. This northern fern is rather rare from northern California near the coast, as far south as Santa Cruz, which is the limit of its range in that direction. It is found growing in soil in coniferous forests.

Woodwardia radicans Smith. The range of this species extends from Mendocino county to San Diego, commoner in the lower hills, but at the south attaining an altitude of 5,000 feet. It inhabits wet, shaded places, as the rocky banks of streams, or the edges of springs, growing luxuriantly, the fronds often six to eight feet in length.

Asplenium vespertinum Maxon. Not uncommon in moist, shady places in the mountains of San Diego county, below 3,000 feet alt. The type was collected by Miss L. F. Kimball, in San Miguel Mt., and I have specimens from Witch Creek, Pala and Poway. In Los Angeles county it was collected by McClatchie at Pasadena, and a few plants were found by Mr. W. G. Wright near San Bernardino, its inland limit.

—— In the Botany of California, Dr. Eaton reports a single collection, in 1855, on Mt. Diablo, of *A. Trichomanes* L., of which species he regarded what is now called *A. vespertinum* as a variety. It does not appear to have been met with again, although that mountain has been explored often since.

Athyrium Filix-foemina Roth. LADY FERN. Growing about springs and boggy places in the mountains throughout the State. In the south it is not found below 5,000 feet alt. Various forms occur, probably throughout its entire range.

Athyrium cyclosorum Rupr. Data are wanting for the definition of the limits of this species, which usually is confounded with the preceding. It is a mountain fern, and its probable range is from central California northward.

Phegopteris alpestris Mett. A fern of high altitudes in the northern part of the Sierra Nevada, where it forms dense patches in rocky places. It has been collected at Lassen's Peak, Pyramid Peak, Mt. Shasta, Mt. Stanford, Webber Lake, etc.

Nephrodium Nevadense Baker. In meadows and wet places, at high altitudes in the Sierra Nevada, from Mariposa, where collected by Congdon, to the northern boundary of the State, and thence northward into Oregon.

Nephrodium patens Desv. This aberrant species has been collected several times at Santa Barbara. There is also a specimen in the herbarium of the California Academy of Sciences collected at Miraflores, Lower California. It is unknown otherwise on the Pacific coast.

Nephrodium Filix-Mas Rich. MALE FERN. Known in this State by a single collection made in 1882, by Parish, in deep crevices of a cliff at Holcomb Valley, alt., 8,000 feet., in the San Bernardino Mts.

Nephrodium rigidum argutum Davenp. This is a common species on stony and partially shaded slopes, from San Diego to the northern boundary of the State, and thence to British Columbia. In the south its range of altitude is from 500 to 5,000 feet.

Nephrodium spinulosum dilatatum Baker. The only record for this fern in California is a collection made by J. Burt Davy, in 1893, in the woods of the Coast Range near Olema, Marin county.

Polystichum munitum Presl. Common on stony slopes from San Diego county to the northern boundary of the State, and thence northward to Alaska. In the southern mountains its altitudinal range is from 2,000 to 5,000 feet. The var. *imbricans* Maxon has been collected at several stations from Plumas to Trinity county. The var. *inciso-serratum* Underw. was collected in Santa Cruz county by Jones, and in Marin county by Palmer.

Polystichum lonchitis Roth. HOLLY FERN. Underwood reports this fern as collected at Castle Lake in Siskiyou county, by Pringle, which seems to be the only record of its presence in the State.

Polystichum scopulinum Maxon. The only recorded station within the State for this rare fern is in the San Bernardino Mts., at 6,000 feet alt.; but it occurs, most probably, elsewhere in the Sierra Nevada. It grows among rocks.

Polystichum Lemmoni Underw. This is also a rare species, known only from the headwaters of the Sacramento river in Mt. Shasta, and from Alaska.

Polystichum aculeatum Roth. This is a species of the central and northern coasts of the State, from Santa Cruz county to Ukiah, and, doubtless, northward to the boundary. The var. *Californicum* Underw. is reported from the same range as the species; the var. *lobatum* Lind. and Moore from Santa Cruz to Mendocino; the var. *angulare* Presl. from Santa Cruz only; but they are all likely to accompany the species throughout its range.

Cystopteris fragilis Bernh. BLADDER FERN. Found in all the mountainous districts of the State. The varieties *dentata* Hook. and *laciniata* Davenp. have also been collected here. Its habitat is on damp, shaded rocks, notably along the banks of streams. In the south it ascends at least to 8,000 feet alt.

Woodsia scopulina Eaton. From Mono Pass northward, in the higher Sierra Nevada.

Woodsia Oregana Eaton. At high altitudes in the Sierra Nevada, from San Bernardino Mt., where it is very rare at about 8,000 feet alt., to the northern boundary of the State, and thence to British Columbia. It has been collected also on San Pedro Martir Mt., Lower California, by Mr. Brandegee. This is its southern limit. It grows in tufts among rocks.

MARSILIACEÆ.

Marsilia vestita Hook and Grev. This plant apparently has a wide range in the State, both in latitude and in altitude, but is neither common or abundant. Cuyamaca Mts., in San Diego county, is the most southern locality at which it has been collected, and I know of none more northern than Yuba county. It grows in clumps or creeping on muddy banks.

Pilularia Americana A. Br. In winters of abundant rainfall, little pools form in hollows of the clay mesas about San Diego, and on the surface of these pools, and on their muddy margins, these plants find a congenial home. Often successive years pass

with rainfall insufficient to maintain these pools, and consequently without affording the *Pilularias* an opportunity for growth. Reported also from Santa Barbara, probably under similar conditions, and may be expected, in suitable situations, in the intermediate territory.

SALVINIACEÆ.

Azolla filiculoides Lam. This pretty little plant is very common in the southern part of the State, below 1,000 feet alt. It floats on the still pools of streamlets, or roots in their muddy banks, and, in either case, is gregarious in dense patches. The fronds are commonly brightly tinted with red. *A. Caroliniana* Willd. may occur in the north, but authentic specimens are not known.

EQUISITACEÆ.

Equisetum arvense Linn. In damp soil, notably on the borders of copses, in the Sierra Nevada, from San Bernardino county northward, at 3,000 to 8,000 feet alt., or more rarely descending as low as 1,000 feet. Probably also through the Coast Range, but the only specimens seen therefrom are from Ojai, in Santa Barbara county.

Equisetum Telmateia Braunii Milde. From San Bernardino to San Francisco, growing on the borders of swamps and streams. It is confined, apparently, to an altitudinal range not exceeding 1,000 feet.

——— *Equisetum rammosissimum* Desf. There is in the herbarium of the National Museum a single sterile specimen that is confidently referred by Mr. A. A. Eaton to this species, which is not known otherwise in North America. It was collected on Mt. Wilson, near Los Angeles, by Dr. A. Davidson. Further material is desirable.

Equisetum Funstoni A. A. Eaton. This is the most abundant scouring-rush in southern California. Its range extends from Santa Barbara to San Diego and San Bernardino; and it also reaches the desert region, where it has been collected at White-water, Palm Springs, Camp Cady, and in the Panamint Mts. On the hither side of the mountains its altitudinal range is probably not over 2,000 feet, but in the Panamint Mts. it was found as high as 5,300 feet alt. It grows in damp, or occasionally in quite dry, soil, and mostly in partial shade. It runs into a series of di-

verse forms, of which *caespitosum*, *nudum*, *polystachyum* and *ramosum* have been given names by Mr. Eaton. Until Mr. Eaton proposed for it its present name, it had been referred to *E. variegatum*, *E. laevigatum*, *E. robustum*, and more recently to *E. Mexicanum*.

Equisetum robustum A. Br. This species is not rare throughout the State. In the south it grows by streams and in marshy places, in the mountains, at 2,500 to 5,000 feet alt.

Equisetum hyemale L. This species has been reported from several parts of this State, but according to Mr. Eaton, it is not even American. He recognizes, however, the following varieties, namely: var. *Californicum* Milde, ranging from San Francisco to Nevada and British Columbia; var. *herbaceum* A. A. Eaton, Kaweah river and Kernville; var. *intermedium* A. A. Eaton, Monterey county.

Equisetum laevigatum A. Br. The only California specimens of this species identified by Mr. Eaton were from Panamint Mts. and Kern river. In the Botany of California it is reported from Santa Clara county.

SELAGINELLACEÆ.

Selaginella Bolanderi Hieron. The type of this species was collected on shaded nooks, near Auburn, April, 1865, by H. N. Bolander, and is No. 4511 of his distribution.

Selaginella Watsoni Underw. A plant of high altitudes in the Sierra Nevada, growing in rocky places at 6,000 to 10,000 feet alt., from San Jacinto Mt. to Alpine county, and probably further northward.

Selaginella Hansenii Hieron. The following specimens are cited in the original description of this species: Mokelumne river, near Fisher's Cabin, in the Sequoia forests, by Geo. Hansen, No. 878, April, 1893; Oakland Hills, Hillebrand, 1863; Sierra Nevada Mts., in Fresno county, A. A. Eaton, 1892.

Selaginella Bigelovii Underw. An abundant species of the southern counties, ascending the mountains at least to 3,500 feet alt. It grows in stony soil, at the base of rocks, or in clay soil in the shelter of shrubs.

Selaginella cinerascens A. A. Eaton. In the coast mountains of San Diego county. The type was collected by Miss Kimball,

at National City. It extends inland at least to Poway, where it was observed by Parish, growing on clay banks.

Selaginella sp. An undescribed *Selaginella* of the *S. rupestris* group, occurs along the base of the mountains bordering the Colorado Desert. It has been collected at Palm Springs by Mr. C. F. Saunders, and at Whitewater by Parish. Other segregates of this group probably will be found to occur in the State, but, according to Dr. Underwood, the species itself, *S. rupestris* Spring., does not extend westward of the Great Plains.

——— *S. Oregona* Eaton and *S. Douglasii* Spreng. are to be expected in the extreme northwest of the State, but I have been unable to learn of any collection of either species within our boundaries.

ISOETACEÆ.

Isoetes occidentalis Henderson. Collected in Castle Lake, near Mt. Shasta, by C. G. Pringle.

Isoetes melanopoda T. Gay. The form described by Mr. A. A. Eaton as *f. Californica* has been collected near San Francisco; and *f. pallida* at Monterey and Kaweah river, and in Lower California.

Isoetes Bolanderi Engelm. This species is found in shallow ponds and streams, at 5,000 to 10,000 feet alt., in the Sierra Nevada, from the San Bernardino Mts. to the northern boundary of the State, and thence into Washington. The var. *Sonnei* Henderson was collected by Sonne in Donner Lake.

Isoetes pygmaea Engelm. Growing deeply immersed in a cold alpine stream, on the eastern slope of Mono Pass, altitude 7,000 feet., in the Sierra Nevada, where the type was collected by Bolander, in 1866. It has not been found since, and may be a form of *I. Bolanderi*.

Isoetes Howellii Engelm. The type was collected by Howell at the Dalles, in Oregon. In California it has been collected in Trinity and Calaveras counties, and as far south as Monterey and the Kaweah river. Perhaps a variety of *I. melanopoda*.

Isoetes Nuttallii A. Br. This is a terrestrial species, discovered in 1833, by Nuttall, on the banks of the Columbia river. The only recorded station in California is Marin county, where it was collected by Mrs. Brandegee.

Isoetes Orcuttii A. A. Eaton. Growing in the same evanescent pools at San Diego, already mentioned as the habitat of *Pilularia Americana*. Like it, they soon disappear after the pools dry up, and occur at all only in wet winters. San Diego is the type station, and the plant has been collected only there and in adjacent Lower California.

THE MEASUREMENT OF VARIATION IN EQUISETUM.

BY WILLARD N. CLUTE.

Two years ago, I had the pleasure of collecting in Louisiana, that form of the scouring rush called *Equisetum robustum*. It is the only species known to grow in that State and has always been identified as true *robustum* from the time of Rafinesque to the present, but upon studying it, I could see no differences worthy of note between it and the common *Equisetum hyemale* of the Eastern States. I was, therefore, not surprised when Mr. A. A. Eaton named it a mere variety of *E. hyemale*. Opinions as to what are specific differences, however, are likely to vary and with the idea of trying to find a safe basis for an estimation of value of these differences I decided to see what a measurement of the various parts would show.

MATERIAL.

Through the kindness of Prof. R. S. Cocks, of New Orleans, I received upwards of 100 specimens of *E. robustum* from that city, while Mr. H. C. Skeels furnished me with a similar number of stems of *E. hyemale* from Joliet, Ill. I also collected about a hundred specimens of *hyemale* at Patterson, Ill. The material was selected by going to an *Equisetum* thicket late in the year after all growth had ceased and selecting the nearest stems without regard to height or thickness, cutting them close to the earth. From this material all defective stems were subsequently removed; defective stems being defined as those that plainly had not matured, those that had been injured, and stems of the second year bearing branches. Mr. Skeels' specimens were selected with the view of getting a complete series of stems from small to large regardless of the part of the thicket from which they came. This will account for certain discrepancies in the measurements of the

two sets of *hymale*, though the close agreement in most particulars will only emphasize the fact that this species is not nearly as variable as has before been imagined. Extremes are very few in number. Mr. Cocks' specimens were received still attached to the rootstocks and each clump appeared to consist of a few stems of large calibre, surrounded by others much smaller. The larger stems appear to be the ones that bear fruit and this possibly accounts for the large size of the specimens seen in collections. Further observations upon this point are greatly desired. It would be interesting to know whether there is any decided difference between the two forms in what are usually called specific characters. It is certain that the number of grooves in the stem is not always greatest in the largest stems. All measurements were made while the stems were fresh.

MEASUREMENTS.

Height.—Owing to the manner of growth, height is not of special significance in *Equisetum*. Data of this kind, however, are interesting for comparison and the height of the specimens measured are here presented:

Height in Inches.						25	26	27	28	29	30	
83 Patterson sp.....						0	0	0	3	4	5	
100 Robustum						5	2	3	2	0	6	
31	32	33	34	35	36	37	38	39	40	41	42	Av.
6	10	11	8	11	10	4	4	5	1	0	1	34 in.
3	16	11	9	10	4	5	4	8	8	2	2	34 in.

The two forms thus appear of equal average height, though owing to the small stems of *robustum* mentioned, the latter shows the widest range.

Diameter of Stems.—The diameter of the stem varies little and may therefore be considered of great diagnostic value. The table below will show this.

Diameter in 32nds of Inch.						4	5	6	7	8	9	10	11	Av.
51 Joliet sp.....						4	12	17	10	8	0	0	0	6X
81 Patterson sp.....						0	0	26	35	18	2	0	0	7
122 Robustum.....						8	25	46	14	19	5	3	2	6X

Again the average is practically the same, but distributed differently. Without doubt if only mature fruiting stems of *robustum* were measured the difference in size would be greatly in

its favor, but the average of all stems seems to point to its close alliance with *hyemale*.

Length of Joints.—In all specimens I have seen, the first two or three joints above the ground are shorter than the rest; in fact, the joints continue to increase slightly until the middle of the stem is reached. The fourth joint above ground is of about average length and this was the one measured.

Length of joint in inches and eighths.	1 in. × 5	6	7	2 in.	1	2	3
53 Joliet sp.....	1	3	7	14	8	11	2
76 Patterson sp.....	0	0	0	0	1	2	12
104 Robustum sp.....	0	0	0	0	6	14	20
	4	5	6	7	3 in.	1	Av.
	6	1	0	0	0	0	2¼ in.
	14	16	18	10	2	2	2½ in.
	36	17	11	0	0	0	2⅜ in.

From this it appears that the specimens of *robustum* average slightly shorter in the joints than those of *hyemale* and notwithstanding its number of small stems does not have so great a range as *hyemale*. The longest joint found in any part of 150 stems examined measured 3⅜ inches.

Number of Grooves.—One of the most important points in distinguishing *Equisetum* species is the number of grooves in the stem. From the following table it appears that while the extremes may be wide apart, the bulk of the stems vary but little:

Number of Grooves.				19	20	21	22	23	24	25
50 Joliet sp.....				1	0	1	1	1	3	4
73 Patterson sp.....				0	0	0	1	3	9	19
110 Robustum				4	9	13	10	10	10	12
26		27	28	29	30	31	32	33	34	Av.
5		7	13	4	5	3	2	0	0	27×
10		18	4	6	3	0	0	0	0	26×
9		8	7	4	2	2	5	4	1	23

The small number of grooves above noted for *robustum* is clearly due to the small, perhaps secondary, stems.

Sheaths.—The length of the sheath is practically unvarying. In none of the specimens examined did they measure more than a quarter of an inch or less than three-sixteenths. The width of the sheath varied with the diameter of the stem, the longest sheaths being always on the largest stems.

CONCLUSIONS.

While it is possible that not enough stems have been measured to give the exact averages for either *hyemale* or *robustum*, it is believed that a further examination of material will not materially change the results if care is exercised to count strictly mature stems. The most likely effects will be to throw the maximum stem length for *robustum* above 34 inches and the raising of the average diameter of the stem and the average number of grooves in the stem, up to or slightly beyond the average for *hyemale*. The average length of joint in either species will probably not be changed, and all the averages for *hyemale* as expressed by the Patterson specimens are likely not to be shifted more than one point in either direction.

I am therefore convinced that *robustum* is properly only a stouter form of *hyemale*. It differs from the form in the Eastern States in retaining the teeth of the sheaths, in producing branches more freely, and in being usually larger.

Extended measurements of this kind are very much to be desired in other closely related species, and I take the liberty of suggesting that a similar bond of union may be found to exist between *E. laevigatum* and *E. Funstoni*. It is likely, also, that measurements of *E. palustre*, *E. fluviatile* and *E. arvense* would show which has the closest affinity for the so-called *E. littorale* and probably indicate its parentage if a hybrid.

Joliet, Ill.

REMARKS ON SOME FERNWORTS OF WESTERN
NEW YORK.

By E. J. HILL.

When reading the article of Mr. Gilbert on the "Fern Flora of New York" in the FERN BULLETIN for October, 1903, it occurred to me that some extension could be given to the geographical range of a few species which occur in the western part of the State, or uncertainties removed and other matters of interest added. Being a native of the region, my study of botany and collecting began there, and have been supplemented by visits at various times since. An effort has also been made to keep informed of botanical work represented in the local floras occasionally published.

It is stated in the article that *Botrychium lanceolatum* Angs. had not been reported from the western part of the State. It has, however, appeared in two of the floras, that of Buffalo and vicinity, compiled by David F. Day, and published at Buffalo, 1883. and in the plants of Monroe county and adjacent territory, published in the Proceedings of the Rochester Academy of Sciences, vol. 3, Rochester, 1896. In the former it is recorded as rare, and one station mentioned, Cassadaga Lake, Chautauqua county. In the latter it is also given as rare, with one station recorded, Holley, Orleans county. It is probable that these were the only localities known at the time to the respective compilers, or others would have been specified. But another can be added, of which mention has not before been made, Attica, Wyoming county. In August, 1879, I found good fruiting specimens in the southern part of the town near the line of Orangeville, and again, in August, 1888, in the same piece of woods. It was rare, but had maintained its place for the nine years intervening. The wood was chiefly composed of maple and beech, with a goodly supply of hemlock. The ferns seemed to prefer the hemlock association, as if liking rather deep shade. Taking the three stations thus recorded for western New York, Holley, just south of Lake Ontario and a short distance west of Rochester; Attica, nearly midway across the State to the line of Pennsylvania, and Cassadaga Lake, a few miles south of Dunkirk, in the southwestern county of the State, the range of the fern may be said to be commensurate with the region. Being thus scattered, it doubtless occurs in other localities, but so small a plant, half hidden in the rotting leaves of woods, is easily overlooked. As to altitude, Holley (the railroad station) is given as 533 feet, Lake Cassadaga, one of the sources of the Mississippi by way of the Ohio, 1,300 feet. The station in Attica, on the high hills which separate the waters which reach Lake Ontario through the Genesee river, and the Niagara river by way of Tonawanda creek, must be fully as high.

Botrychium matricariaefolium A. Braun is also reported in the Rochester catalogue. Three localities are east of the Genesee river, Wayne county, Henrietta and Webster, Monroe county, and one west of the river, Holley.

Under *Asplenium Trichomanes* L. it is stated in Mr. Gilbert's list: "On limestone rocks, middle and eastern parts of the

State. Localities comparatively few. Common in the southern part, *Clute*." While this does not exclude the western part of the State, it leaves the impression that the presence of the fern there was not known to the compiler. Mr. Day gives it in the Buffalo catalogue, but does not indicate localities. This is explained as meaning that the range of a plant is throughout the area considered, one with a radius of fifty miles, taking Buffalo as the center. In the Rochester list it is said to be rare, and three stations are mentioned: "Glen east of Float Bridge," Holley and "The Gulf," Genesee county. Of these I am familiar with the last only, situated in the town of LeRoy. It is a gorge in the corniferous limestone, on which the fern grows associated with *Polypodium vulgare* and *Camptosorus rhizophyllus*. I collected the spleenwort here in 1860 and again in 1895, so that it bids fair to persist in this wild but quite frequented gorge. Whether the other stations are on limestone I do not know, but I have found it on a different substratum on "Thomson Ledge," in northern Ohio, a cliff of millstone grit, or sandstone matrix with abundant quartz pebbles. Here it was associated with *Polypodium vulgare* and *Cystopteris fragilis*.

But one more plant of the article requires notice, *Equisetum palustre* L., a representative of a more northern flora in general. A station is given it in "swamps near Buffalo," on the authority of Judge Clinton. A definite locality is assigned it by Day: "Squaw Island, Niagara river." One station is noted in the Rochester list, "Margin of Genesee river, near Lake Ontario."

Chicago, Ill.

A NEW SPECIES OF EQUISETUM.

BY WILLARD N. CLUTE.

While returning from a trip after specimens of *Equisetum*, recently, I passed a colony of these plants on a hillside in the suburbs of Joliet, Ill., and gathered a bundle of the stems for study. At the time I supposed the species was *Equisetum hyemale*, but upon comparing the stems with specimens of *hyemale* from several other near-by localities it became very evident that except for fairly close resemblance in the cross section of the stem, they differed greatly from this well-known species. Since the distribu-

tion of Mr. Alvah A. Eaton's valuable sets illustrating the genus *Equisetum* we are familiar with the fact that *Equisetum hyemale* presents many different forms, the most prominent of which might well be called species were they not connected with the type by numberless intergrades. It is, therefore, the more surprising to find this newly discovered form does not intergrade with *E. hyemale* to any significant extent. I regard it as a distinct species and have tabulated some of the differences below in comparison with specimens of *E. hyemale* from another locality not two miles distant from the station for the new species.

Diameter of Stem.

	In 32nds of an inch.	3	4	5	6	7	8	9	Av.
81 <i>E. hyemale</i>		0	0	0	26	35	18	2	7
58 New Species.....		18	36	4	0	0	0	0	4

Length of Joints.

	Inches and 8ths.	2 in. × 1	2	3	4	5	6	7	3 in	1
76 <i>E. hyemale</i>		1	2	12	14	16	18	10	2	2
55 New Species.....		0	0	0	0	0	0	0	0	0
	2 3 4 5 6 7 4 in.	1	2	3	4	5	6	7	Av.	
	0 0 0 0 0 0 0	0	0	0	0	0	0	0	2 $\frac{5}{8}$	
	1 2 3 2 1 4 0	7	10	5	10	4	2	4	4 $\frac{3}{8}$	

Grooves in Stem.

Number.....	12	13	14	15	16	17	18	19	20	21
73 <i>E. hyemale</i>	0	0	0	0	0	0	0	0	0	0
52 New Species.....	1	1	8	9	9	14	5	3	1	0
	22	23	24	25	26	27	28	29	30	Av.
	1	3	9	19	10	13	4	6	3	26
	1	0	0	0	0	0	0	0	0	16

Thus it will be seen that not only are the averages for the two species very far apart, but that the extremes of the one actually leave off before those of the other begin. In diameter of stem, there is a difference of three thirty-seconds of an inch between the averages and while the maximum of the new species touches five thirty-seconds, the minimum of the other only reaches six thirty-seconds of an inch. Again, in the grooves of the stem, the maximum of the new species lacks two of reaching the

minimum of the other while the averages are ten grooves apart. It is in the joints of the stem, however, that the greatest difference to the eye is apparent. The new species has longer joints than any other species I have seen, in some cases measuring six and one-half inches. The shortest joint in 55 specimens measured was $3\frac{1}{4}$ inches long, while the longest of 81 *hyemale* reached only $3\frac{1}{8}$ inches and the averages show a difference of nearly two inches.

The slender stems with a paucity of grooves and extremely long joints are sufficient to make this a remarkable plant; but there are other differences. The black markings on the sheath encircle the stem obliquely, the sheaths themselves are thin and chalky-white, the color of the stems is light gray green, and there is a very noticable tendency in the stems to break at the joints; the weight of the stem is sufficient to break it if held horizontally by the basal joints. The stems when fresh are nearly smooth and resemble *E. hyemale intermedium* in this respect, but the sheaths are not dilated upward as in that form, nor are they colored like the stem. I have examined every sheet of *Equisetum* in the Missouri Botanical Garden without finding anything that by any stretch of imagination can match it nor was a search through Mr. Eaton's distributed specimens more successful. I therefore would name and describe it as follows:

EQUISETUM FERRISSI n. sp. Rootstock slender, resembling that of *E. hyemale*; stems smoothish when fresh, 24 to 36 inches high, average about 26, slender, 3 to 5 thirty-seconds of an inch in diameter, average 4 thirty-seconds; joints very long, from $3\frac{1}{8}$ to $6\frac{1}{2}$ inches, average $4\frac{3}{8}$, with from 12 to 22 grooves, average 16; sheaths chalky-white, appressed to the stem, with a black band encircling the base obliquely, widest on shortest side of sheath, narrowest part of the band about one-fifth the length of the sheath; teeth cohering in groups, slender, deciduous, two-thirds the length of the sheath, with a narrow brown central portion and a wider hyaline margin; leaves ridged below, grooved at the tip, the tips dark brown, slightly thickened and incurved; grooves between the leaves extending below the basal band. Fruiting parts not seen.

Collected on the margin of a thinly wooded slope at Joliet, Ill., Sept. 8, 1903, and described from specimens in my own

herbarium. I take pleasure in naming this species for Mr. James H. Ferriss, whose energy in collecting and cultivating ferns has greatly increased our knowledge of these plants, and in whose collection I first saw this species growing.

THE GENUS *EQUISETUM* IN NORTH AMERICA.

BY ALVAH A. EATON.

SIXTEENTH PAPER.

E. VARIEGATUM Shleicher.

Stems naked or rarely branched, rough or smoothish, angles 4 to 12 bearing two lines of tubercles or rarely cross bands; sheaths campanulate (in type) or cylindrical, short or elongated, never truncate; leaves distinctly four angled, with a deep carinal groove which is decurrent into the stem ridges, basal half of teeth persistent, oblong or ovate, membranaceous with dark median-grooved center, ending in a deciduous subulate rough point or (in *Jesupi*) with persistent points, connivent in groups; ridges broad, biangulate, with two rows of tubercles, rarely with bands; grooves twice as broad with stomata in one rowed series and bands of rosulæ.

In its typical state this is a very distinct species, but it grades insensibly into *hiemale* on the one hand and *laevigatum* and *ramosissimum* on the other. Taken by itself variety *Jesupi* would fall in *hiemale* after variety *Doellii*, which it strongly resembles; but it is even more like the European *variegatum* *Wilsoni*, and the European *trachyodon* connects the latter to forms like *Alaskanum*, which in turn lead to the type. Milde notes some European forms that run into *ramosissimum*, and our variety *Nelsoni* could as well be placed under *laevigatum*, but the small centrum and rosulæ make it more natural to place it here.

The bast of typical *variegatum* is similar to that of *laevigatum*, the vallecular being longer, often meniscus-shaped, cutting the parenchyma to the cavity. In the section to which *Jesupi* belongs the carinal is predominately larger, but this character is seldom constant in this species even in the same cross-section. Milde considers the decurrent median groove of the sheaths as diagnostic. The species may be tabulated as follows:

I. RIDGES WITH TWO ROWS OF TUBERCLES.

A. Diameter of centrum 1-3 to 2-3 that of stem, carinal bast longer than vallecular, teeth more or less divaricate, the tips not deciduous, sheaths light (in old or wet stems), ridges bluntly biangulate. *Jesupi*.

B. Diameter of centrum 1-3 that of stem, vallecular bast usually longer, extending to the cavity, teeth broad, black and white, with deciduous filiform tip.

1. Stout, 2 lines in diameter, 1 to 2 feet high. Sheaths light.—
..... *Alaskanum*.

2. Stems slender, tufted, 1 line in diameter, sheaths amplified. *Variegatum*.

II. RIDGES ROUNDED.

Stems annual, sheaths amplified when dry, close when fresh or wet, centrum $\frac{1}{2}$ the diameter. *Nelsoni*.

1. *Jesupi* A. A. Eaton. Stems 6 to 18 inches tall, 1 to 2 lines in diameter, pale green, naked or branched the second year, deeply 10 to 15 grooved, the ridges square or biangulate. Stomata in a single rowed series, the valleculæ with many distinct banded or scattered rosulæ in young stems, later obscured by a deposit of silex. Sheaths long, tight in fresh or wet stems, the younger one contracted at the nodes when dry, the basal black, the middle with black ring, the uppermost with black tips, becoming ashy and deciduous in fragments in old stems. Leaves sharply four angled. Teeth not articulated to the sheaths, persistent, grooved in the middle, broad, hyaline with narrow black center, excurrent into a rough persistent awn $1\frac{1}{2}$ times as long, usually cohering in groups, variously spreading, at times fading and withering. Central cavity 1-3 to 3-5 the total diameter, the vallecular holes large, transversely oval, the vallecular bast small, not separating the green parenchyma, while the carinal follows the dissepiments nearly to the carinal canal, the arrangement being just the opposite of *variegatum*, and as in the *Hiemalia*. The ribs bear regular or fragmentary cross-bands, and become biangulate by the lateral epidermal cells bearing a heavier deposit of silex. It differs from *variegatum* in its size, the blacker sheaths, persistent awns of the teeth, the broader keels with deeper grooves, more sharply and irregularly tubercled on the angles, the deciduous sheaths and the bast and parenchyma. Its appearance is almost exactly like *hiemale pumilum* from which it

differs in the biangulate ridges, the small centrum and the rosulæ. It is a question if it would not be more in accordance with Nature to remove this, *Wilsoni* and *trachyodon*, to the biangulate *hiemalia*, where the majority of their affinities lie. Ft. Kent, Me., *E. F. Williams*; Wakefield, Que., *Macoun*; Union Village, Vt., *F. Blanchard*; Royalston, Vt., banks of White river. sand near water, *Eggleston*; near Port Huron, Mich., *C. K. Dodge*.

SARAH FRANCES PRICE.

On July 3, 1903, Sadie F. Price died at her home in Bowling Green, Kentucky. A notice of her death has already appeared in this journal, but her contributions to science were so many and so varied that a more extended account of her life is desirable and the following biography is therefore presented:

Miss Price was born in Evansville, Indiana, in 1849, but her parents soon thereafter removed to Kentucky, in which State she always resided. She was educated at a church school in Terre Haute, Indiana, and having excellent teachers in science soon became interested in natural history. In later years this knowledge was turned to good account in teaching classes in nature study at her home.

Although for much of her life a semi-invalid, Miss Price accomplished a vast amount of work. She had an herbarium of nearly two thousand Southern plants, about half of which she had reproduced in pencil and water color. Part of these sketches were exhibited at the World's Fair at Chicago in 1893, and received an award. She also made upwards of 150 colored sketches of Kentucky birds. She was familiar with the land and fresh water shells of her region and published a list of them. She was the discoverer of new species of plants in the genera *Aster*, *Apios*, *Cornus*, *Clematis* and *Oxalis*.

To fern students she is best known through her book, "The Fern Collector's Hand-book and Herbarium" (1897), but she also published in 1890 two compilations, "Songs from the Southland" and "Shakespeare's Twilights." Of lesser publications may be mentioned "The Flora of Warren County" (1893), and "List of Trees and Shrubs of Kentucky" (1895), and numerous articles and notes contributed to the periodical press.

TREASURE TROVE.

BY A. B. KLUGH.

In the southeast corner of Wellington County, Ontario, in the midst of a mixed bush, stands a piece of rock some fifty yards long by twenty-five feet in height. From a little distance it appears to be a very ordinary piece of rock, but on the first near approach a fern student feels a sudden desire to shout, for there in the mossy recesses he sees *Pellaea gracilis*, on the ledges *Camp-tosorus rhizophyllus*, at the edge and on some of the upper ledges *Polypodium vulgare*, and scattered all over the whole rock *Cystopteris bulbifera*.

The existence, in a flourishing condition, of these ferns on a rock by no means damp, and of so small extent is interesting, if not unique. It might be mentioned that this is one of the two stations known in the country for *Pellaea gracilis*, that *Camp-tosorus rhizophyllus* is fairly common and widely distributed, that *Polypodium vulgare* is scarce, being absent from all our big masses of rock, and that *Cystopteris bulbifera* is our most abundant fern, growing in all our damp woods and on all cliffs and rocks.

Another interesting little spot is to be found in a sphagnum swamp near Guelph, as here within a radius of four yards I found *Botrychium Virginianum*, *Osmunda cinnamomea*, *Adiantum pedatum*, *Athyrium filix-foemina*, *Phegopteris dryopteris*, *Cystopteris bulbifera*, *Nephrodium thelypteris*, *N. cristatum*, *N. marginale*, *N. spinulosum*, and *N. boottii*, and for the last named species it is the only station known, it being very rare in this locality.

Guelph, Ontario.

ASPLENium EBENOIDES.

During a week's stay in eastern Pennsylvania, I made a botanical excursion with the express purpose of finding *Asplenium ebenoides* in a spot where *Asplenium ebenum* and *Camp-tosorus rhizophyllus* are growing in company. The result was two plants not only of *ebenoides*, but that rare form of it which has rounded instead of lanceolate pinnules. I report the occurrence of these as additional evidence in favor of the theory of hybridity.—James M. Fetherolf, Bureau of Forestry, Washington, D. C.

INDEX TO CURRENT LITERATURE RELATING TO FERNS.

Readers are requested to call our attention to any omissions from this list.

CLUTE, W. N. *Fernwort Notes—IV.* Fern Bulletin, O. 1903.

CLUTE, W. N. *The Species Conception Among the Ternate Botrychiums.* Fern Bulletin, O. 1903.

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DRUERY, C. T. *New Forms of Ferns.* Fern Bulletin, O. 1903.

EATON, A. A. *Additional Notes on Botrychium tenebrosum.* Rhodora, N. 1903.

EATON, A. A. *The Genus Equisetum in North America.* Fifteenth Paper. Fern Bulletin, O. 1903.

EATON, A. A. *Three New Varieties of Isoetes.* Rhodora, N. 1903.

FREEMAN, G. F. *Lycopodium Selago on Mt. Holyoke.* Rhodora, D. 1903.

GILBERT, B. D. *The Fern Flora of New York.* Fern Bulletin, O. 1903.

HOUSE, H. D. *Scolopendrium from Canada.* Fern Bulletin, O. 1903.

KLUGH, A. B. *The Fern Flora of Wellington County (Ontario).* Guelph Herald, No. 1, N. 20, 1903; No. 2, N. 27, 1903; No. 3, D. 4, 1903; No. 4, D. 11, 1903; No. 5, D. 18, 1903; No. 6, D. 24, 1903.

UNDERWOOD, L. M. *The Early Writers on Ferns and Their Collections—I.* Torrey, O. 1903.

WATERS, C. E. *Asplenium ebeneum proliferum.* Rhodora, N. 1903.

WOOLSON, G. A. *New Station for Asplenium ebeneum Hortoniae.* Fern Bulletin, O. 1903.

WOOLSON, G. A. *Another Station for Asplenium ebeneum Hortoniae.* Rhodora, O. 1903.

WOOTON, E. O. *The Ferns of the Organ Mountains.* Torrey, N. 1903.

——— *Ferns in Bottles.* Fern Bulletin, O. 1903.

EDITORIAL.

Several times, lately, the editor has received communications in which the writers were very evidently laboring under the delusion that the subscription list of THE FERN BULLETIN consists entirely of the 130 members of the Fern Chapter. The last letter of this kind came from an editor with a prosperous and influential paper of his own—a man who ought to know better—so it seems to us about time to say something on this topic. We must no longer be considered such philanthropists as to run a publication for eleven years out of regard for fern students—fine people though they be—nor must we be thought vain enough to publish this journal for the gratification of seeing our name in print. These of course may be subsidiary motives, but the main one is that which actuates most other publishers and is represented by a symbol which looks like a capital S rampant surcharged with two perpendicular parallel lines.

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The newspaper directories say that there are about 22,000 different newspapers and magazines published in America; but notwithstanding the fact that there are many people who subscribe for several publications—and pay for them—three-fourths of these 22,000 periodicals do not have as many as a thousand subscribers each—dead-heads and all. It is believed that no botanical publication in America issues more than a thousand copies. THE FERN BULLETIN, therefore, takes pride in its issue of 750 copies and considers that when publications devoted to the whole field of botany cannot secure a subscription list of a thousand, its own list of subscribers, every one of which is a fern student, offers a fine chance to crow if the editor were not so modest.

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It is surprising that the sapient scientist who can pick out a new species at forty rods, should be so incapable of judging when it comes to paper and type. He has actually had the hardihood to speak of our pages as *little*, when there is not a prominent botanical journal going that prints as many words to the page as we do. It does seem that nothing but 12-point type and “scare heads” will make an impression on some people. We begin to

doubt the statement that the study of botany strengthens the power to observe.



If we were not sorry for these well-intentioned but misguided people without the pale, and desirous of contributing to their future well being, we would not waste the time to make this long and circumstantial explanation, but now that we have made it, we do not expect any great increase in the subscription list, for we feel sure we have nearly all the American fern students on the books as it is.



In fact, this is not an appeal for subscriptions—it isn't an appeal for anything. We are in much the position of the old gentleman, who in the midst of a lively discussion exclaimed, "I'm not arguing with ye, I'm jest a telling ye." We are just a telling the writing public that if they wish to reach the fern student they can do it best through THE FERN BULLETIN. An article on ferns published in a magazine devoted to general botany will be seen by from 300 to 800 people, but these people are *not fern students*. It is true that the pressure on our columns is often so great that good articles have to be held over and poor ones declined, yet the advantage of reaching all the students of ferns makes publication in its columns worth striving for. A new fact about a common fern is as welcome at this office as the description of a new species. Novice, amateur and professional have an equal chance to present the results of their work and are cordially invited to do so.

BOOK NEWS.

Among recently issued volumes in the "Hand Books of Practical Gardening" series, is found "The Book of the Honey Bee,"* written by a British writer from the British view-point. This is a very complete treatise not only on rearing and caring for bees, but on making hives, marketing honey, making mead, sources of honey, and allied subjects. Gardening and bee-

*The Book of the Honey Bee. By C. Harrison. New York. John Lane. 1903. 12 mo. 130 pp. \$1.00 net.

keeping go well together, and since Maeterlinck has placed bee life in a new light, many, even in cities, are taking up bee culture as a pastime. All such will find this little book very useful.

The fact that botanists are not unanimous as to what constitutes species and varieties indicates that there is need for careful and extended investigation of the causes that produce them. Those who are minded to go further into the subject will find an excellent discussion of the known facts in Dr. H. M. Vernon's "Variation in Animals and Plants."† In the first part the facts of variation are treated; in the second the causes of variation are considered; and in the last, variation in its relation to evolution is discussed. A great number of experiments with both animals and plants are cited, and two chapters are devoted to Weismann's theory of heredity, which the author is inclined to accept.

†Variation in Animals and Plants. By H. M. Vernon. New York. Henry Holt & Co. 1903. 12 mo. 415 pp.

THE LINNEAN FERN CHAPTER OF THE AGASSIZ ASSOCIATION.

—The new Advisory Council consists of the following: Past Presidents C. E. Waters, chairman; A. A. Eaton, W. R. Maxon and B. D. Gilbert.

—Owing to a change in the treasurer's office, dues for 1904 should be sent to the new treasurer, Mr. C. F. Saunders, 307 Walnut street, Philadelphia, Pa.

—Mr. Robert A. Ware, 246 Devonshire street., Boston, Mass., generously offers specimens of *Polystichum Braunii* from Vermont to anyone who will send five cents in stamps for mailing.

—There have been twelve members added to the Chapter since October 1, 1903. These names and addresses will appear in the list of members to be given in the next annual report which is expected to be ready soon.

—We regret that a few of the members who have received the BULLETIN regularly the past year are yet in arrears for dues. This is undoubtedly only an oversight on their part. The Chapter, however, can only be of greatest usefulness when its revenues

for each year are fully paid in, and we trust that no member will handicap us in this respect.

—The October election gave the following officers for 1904: President, James A. Graves, Susquehanna, Pa.; Vice-President, James H. Ferriss, Joliet, Ill.; Secretary, Homer D. House, New York Botanical Garden, Bronx Park, New York City; Treasurer, C. F. Saunders, 307 Walnut street, Philadelphia, Pa. The full report of the Judge of Elections will appear in the annual report.

THIRD MEETING OF FERN STUDENTS.

The third meeting of fern students under the auspices of the Fern Chapter was held at St. Louis, Mo., Wednesday, December 30, 1903. Eight States were represented by members present. Every member but two, within a radius of 250 miles of St. Louis, was at this meeting, while the application of four new members were received.

The meeting was held in the St. Louis High School and was called to order by Prof. N. L. T. Nelson. As none of the Chapter officers were present, Mr. J. H. Ferriss, the vice-president-elect for 1904, was made president of the meeting and Prof. Nelson was elected secretary.

Prof. W. J. S. Bryan, principal of the St. Louis High School, made a pleasant and cordial address of welcome, to which the presiding officer replied in behalf of the Chapter. The presentation of papers then followed, the first being a paper on "The Ferns of the Southwest," by James H. Ferriss, in which he sketched some of his collecting experiences with observations on the ferns collected. Mr. Ferriss exhibited a nearly complete set of these ferns and some considerable time was spent by those present in examining them. In "New or Rare Ferns from the Southwest," Willard N. Clute discussed some of Mr. Ferriss' specimens, naming two new forms and reinstating one species. Following this with a paper on "The Measurement of Variation in Equisetum," the same speaker detailed some experiments in this line and described a new species which, though like *E. hyemale* in internal structure, is very different from that species in external characters. Mr. J. H. Ferriss then made some observations on "A New Fern from Florida," in which he mentioned

having received *Asplenium lanceum*, a Japanese species from Florida, where it is apparently well established. The question was raised whether this is a naturalized escape, or whether it is a hitherto undiscovered native. Mr. George E. McClure, of the Missouri Botanical Gardens, then spoke on "The Occurrence of *Polypodium angustifolium ensifolium* in Florida." The type of this species is common in the tropics, but previous to the discovery of Mr. McClure's specimens neither type nor variety was known from the United States. Prof. B. Shimek, of the University of Iowa, gave a short paper on the occurrence of "*Woodsia Ilvensis* in Iowa," an interesting extension of range. In another paper on "Ferns from Natchez, Miss.," he recorded the occurrence of *Woodsia obtusa* and *Nephrodium patens* there. This is the farthest known Southern station in the Mississippi valley for the *Woodsia*, and the farthest Northern range for the *Nephrodium*. In "The Species Conception Among the Ferns," Willard N. Clute pointed out the discrepancy between the values of different species of ferns, discussed the characters of diagnostic importance and suggested ways in which a proposed new species could be judged.

The presiding officer then read extracts from the letters of various collectors in Florida in which were detailed the recent discovery there of nearly a dozen species and at least one genus of ferns new to the fern flora of the United States.

The meeting adjourned for lunch at one o'clock. A trip to the Missouri Botanical Garden had been planned for the afternoon, but true to the reputation of fern students for good-fellowship those present elected to return to the high school, where the rest of the day was spent in examining the ferns exhibited by several members and in exchanging opinions about ferns in general. Owing to the lack of fern students in the middle West, the meeting was not as largely attended as were those at Boston and New York, although nearly every fern student within a day's ride of St. Louis was present. The meeting was therefore a success, and fern students will doubtless be encouraged to hold others in the West as favorable opportunities occur.

TWO GREAT OFFERS

Fern Bulletin Offer

The first five volumes have long been out of print. The remaining six cost 75 cents each, or \$4.50 for the set. They contain 784 pages of matter that no student should be without. To subscribers only, we offer the set for 50 cents a single volume, or \$3.00 for the set. Non-subscribers must add 75 cents for 1904, if they wish to take advantage of this offer. This offer expires March 30, 1904.

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Field-Book of American Wildflowers, <i>Mat- theus</i>	" 1.87
How to Know the Wildflowers, <i>Dana</i>	" 2.16
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No. 2.

The Fern Bulletin.

A Quarterly Devoted to Ferns.

APRIL

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1904

THE FERN BULLETIN

A QUARTERLY DEVOTED TO FERNS

WILLARD N. CLUTE, Editor

THE FERN BULLETIN CO., PUBLISHERS, BINGHAMTON, N. Y.

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THE LINNAEAN FERN CHAPTER

PRESIDENT, JAMES A. GRAVES, Susquehanna, Pa. SECRETARY, HOMER D. HOUSE, N. Y. Bot. Garden, Bronx, New York City.

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RAYNAL DODGE

THE FERN BULLETIN

VOL. XII.

APRIL, 1904.

No 2

THE FERN FLORA OF FLORIDA.

By A. H. CURTISS.

While Florida is rich in ferns as compared with other States, yet her fern flora is not half what it would be if her topography and soil were like that of the islands which so closely approach her on the south. In point of fact, there are few other States so poorly adapted to ferns. Nine-tenths of the surface is covered with open pine woods, growing out of coarse sand and affording very little shade. Then there is a large area in the aggregate of marshes and wet prairies which are uncongenial to ferns. Scattered all over the State are what are termed "hammocks," which are groves or forests of what at the north are called hardwood trees, sometimes with an intermixture of pines, and as the soil found in these is mostly sandy, ferns find themselves but little more at home than in the piney woods.

As may be judged from these facts the aggregate quantity of ferns to be found in Florida is very small. A variety of *Pteris aquilina* is the only fern found among the pines, *Woodwardia Virginica* being met with on the borders of wet weather ponds, and *Osmunda cinnamomea* along the borders of small streams. The latter are hidden in almost impenetrable growths of hardwood trees, bushes and vines. In the depths of these thickets is found a very handsome fern, *Nephrodium Floridanum*, and in open miry spots there is plenty of *Nephrodium thelypteris*, *Woodwardia angustifolia* and sometimes *Osmunda regalis*. In the oak woods of Northern Florida one seldom sees any fern except *Polypodium incanum* and *Nephrodium patens*.

This is a most unattractive prospect for a fern collector; yet one can find many a choice fern in Florida if directed to the right places. On the western side of the peninsula there is a region of outcropping limestone running northwestward to the southeastern corner of Alabama and at the south merging into the old coral and "coquina" rock which is somewhat elevated

along the southeastern coast. A fern hunter in Florida should keep to the limestone and whenever it is shaded by oaks and bays he may reasonably expect to find a good variety of ferns. The only exception to this rule is in reality no exception, for the *Cheilanthes* found near the northeastern corner of the State grew on shaded shell mounds. Nearly all the ferns found on the limestone are West Indian species. Far to the south *Pteris longifolia* and *Anemia adiantifolia* grow where there is little or no shade, like swamp ferns, but it is where the sea is so near as to supply plenty of moisture.

An important addition to the lime-loving ferns is found in the epiphytic species, which are found in increasing numbers as one goes southward. The natural laws governing the distribution of ferns by no means apply to the allied orders, which show no liking for calcareous soil.

In the following list are enumerated, I believe, all the species thus far found in Florida. A few of these I have never seen. It is highly probable that a number of other West Indian forms are hidden away in the southern part of the State, waiting for some one to come along and discover them:

OPHIOGLOSSACEAE.

Ophioglossum pusillum Nutt. This I once found growing in abundance just west of Jacksonville in a damp sandy spot with *Ludwigia palustris*, etc. It has also been found much farther south.

Ophioglossum crotalophoroides Walt. Manatee and Fernandina. Not common.

Ophioglossum vulgatum L. ADDERSTONGUE. Not common.

Ophioglossum palmatum Plumier. Rare. Found on the trunks of trees, usually palmettos, in Southern Florida.

Botrychium obliquum Muhl. GRAPE FERN. In low woods in the northwestern part of the State.

Botrychium Virginianum Sw. RATTLESNAKE FERN. With the preceding and probably confined to the same region.

HYMENOPHYLLACEAE.

Trichomanes Krausii Hook and Grev. Southern Florida, *A. A. Eaton*.

Trichomanes sphenoides Kze. Southern Florida. *A. A. Eaton*.

—— *Trichomanes radicans* Sw. Has been reported from the State, but the locality is not known.

OSMUNDACEAE.

Osmunda regalis L. ROYAL FERN. Frequent in swampy places throughout the State.

Osmunda cinnamomea L. CINNAMON FERN. Common throughout the State.

SCHIZAEACEAE.

Lygodium palmatum Sw. CLIMBING FERN. Found in the State according to Chapman, but I have never found it.

Anemia adiantifolia L. On elevated coral. Near Biscayne Bay and on the group of piney keys about 30 miles east of Key West.

CERATOPTERIDACEAE.

Ceratopteris thalictroides Brong. FLOATING FERN. Floating on ponds and streams. I have found it in several localities near latitude 29 degrees, first in October, 1879.

POLYPODIACEAE.

Acrostichum aureum L. Marshes and low woods near tide water in Southern Florida.

Acrostichum lomarioides Jenm. On the southeast coast. Common.

Acrostichum sorbifolium L. Southern Florida, *A. A. Eaton*.

Meniscium reticulatum Sw. Found in the Everglades. First reported by J. H. Ferriss.

Polypodium plumula H. B. K. In the limestone region of Southern Florida.

Polypodium pectinatum L. Rather more plentiful than the preceding and found in the same region.

Polypodium incanum Sw. GRAY POLYPODY. Abundant on oaks in damp "hammocks."

Polypodium aureum L. GOLDEN POLYPODY. Common on Palmettos in Southern Florida, extending northward nearly to St. Augustine.

Polypodium angustifolium Sw. Southern Florida. *A. A. Eaton*.

Polypodium phyllitidis L. In rich hammocks from Cape Canaveral, southward. Found growing on the ground and on old logs and stumps.

Polypodium Swartzii Baker. Eastern end of Key Largo, twining around the stems of bushes and saplings. First found by me.

Vittaria lineata Sm. GRASS FERN. Common on palmettos from Southern Florida, northward, on the east coast nearly to the mouth of the St. Johns River. Fronds pendant.

Tacnitis lanceolata R. Br. Rare. I found a single plant on a small tree between Key Largo and Elliott's Key.

Pteris longifolia L. On coral rock near Biscayne Bay and on the piney keys 30 miles from Key West.

Pteris cretica L. In limestone hammocks of Southern Florida.

Pteris aquilina pseudocaudata Clute. Common in piney woods, approaching *Pteris aquilina* when growing under oaks.

Pteris caudata L. From Cape Canaveral to Cape Sable. Has an erect stem sometimes 8 or 9 feet high, bearing many fronds like those of the variety *pseudocaudata*.

Adiantum Capillus-Veneris L. VENUS-HAIR FERN. On damp shaded banks in Northwest Florida.

Adiantum tenerum Sw. In limestone hammocks of Southern Florida.

Cheilanthes Alabamensis Kze. On limestone, a few miles from Chipley in Northwest Florida. First reported by me in 1901.

Cheilanthes microphylla Sw. Found by me about 25 years ago on a shaded shell mound near the mouth of the St. John's River. It seems since to have entirely disappeared.

Blechnum serrulatum L. In South Florida. A depauperate form occurs with scrub palmetto in damp spots in the pine barrens.

Woodwardia angustifolia Sm. NARROW-LEAVED CHAIN FERN. Common in swamps.

Woodwardia Virginica Sm. COMMON CHAIN FERN. Common in swamps.

Asplenium serratum L. Rare. Found in the southern part of the State.

Asplenium parvulum Mart. and Gal. LITTLE EBONY SPLEENWORT. Following the limestone from near the center of the State to the northern border.

Asplenium ebeneum L. EBONY SPLEENWORT. Northwest

Florida, in a variety of locations; sometimes in fertile pine woods.

Asplenium muticum Gilbert. A form closely allied to *A. trichomanes* and until recently reported for that species. Found near Ocala.

Asplenium dentatum L. Found on shaded coral rock on the southeast coast.

Asplenium auritum Sw. Sumpter Co., Florida.

Asplenium firmum Kze. Limestone region of Southern Florida.

Asplenium cicutarium Sw. With the preceding.

Asplenium myriophyllum Mett. Found with the two preceding.

Asplenium lanceum Thumb. Key Largo. A Japanese species naturalized in this locality.

Athyrium filix-foemina Bernh. LADY FERN. Occasionally met with in rich woodlands.

Onoclea sensibilis L. SENSITIVE FERN. Reported from the State, but not seen by me. Neither Chapman nor Small state that it grows in the State.

Davallia clavata Sw. Southern Florida, *A. A. Eaton*.

Aspidium trifoliatum Sw. First found by me in a limestone hammock on the eastern border of Citrus County. Occasional in the southeastern part.

Polystichum acrostichoides Schott. CHRISTMAS FERN. Hilly woods on the northwest border.

Nephrodium conterminum Desv. Southern Florida.

Nephrodium thelypteris L. MARSH FERN. Common in swamps.

Nephrodium amplum Baker. Southern Florida, *A. A. Eaton*.

Nephrodium patens Desv. Rather common in rich woods.

Nephrodium Floridanum Hook. Moist thickets.

Nephrodium unitum glabrum Desv. Swamps in Southern and Central Florida. Sometimes 8 feet high.

Phegopteris hexagonoptera Fee. BROAD BEECH FERN. Rich woods in Northwest Florida.

Phegopteris reptans D. C. Eaton. Limestone region of Southern Florida.

Phegopteris tetragona Fee. Limestone region of Southern Florida.

Nephrolepis exaltata Schott. SWORD FERN. Southern Florida on palmettos or in soil.

Nephrolepis acuta Presl. SWORD FERN. On the southeast coast.

MARSILIACEAE.

Marsilia vestita Hook. and Grev. Found in one locality in Central Florida.

SALVINIACEAE.

Azolla Caroliniana Willd. WATER FERN. Found floating on still water. Not uncommon.

LYCOPODIACEAE.

Lycopodium alopecuroides L. FOXTAIL CLUB MOSS. Common in moist pine barrens, the variety *pinnatum* often found with the type.

Lycopodium alopecuroides adpressum Chapm. Common in moist or occasionally dry soil.

Lycopodium Carolinianum L. Common in moist pine barrens.

Lycopodium cernuum L. STAG HORN CLUB MOSS. Occasional on moist banks, especially in deep ditches, from Central Florida, northward.

PSILOTACEAE.

Psilotum triquetrum Sw. Occasional in Central Florida.

SELAGINELLACEAE.

Selaginella apus Spring. CREEPING SELAGINELLA. Not uncommon in moist places.

Selaginella Ludoviciana R. Br. Found by me in a low woodland at Chalahoochee, near the northwest border.

Selaginella arnicola Underw. Dry sand barrens of Central Florida.

ISOETACEAE.

Isoetes flaccida Shuttlew. Shaded and somewhat miry spots. Not common.

Isoetes flaccida rigida Engelm. Lake Flirt.

THE GENUS *EQUISETUM* IN NORTH AMERICA.

By A. A. EATON.

SEVENTEENTH PAPER.

VARIETIES OF *EQUISETUM* VARIEGATUM.

2. *Alaskanum* A. A. Eaton. Aspect of small *hiemale*. Rootstocks dull black; roots densely brown felted; stems tufted, 6 to 32 inches tall, 1 to 2 lines wide, usually erect, decumbent or assurgent in small forms, 8 to 12 angled, deeply and broadly grooved, occasionally branched the second year; branches often 6 inches long, short if fruited; internodes 1 to 2 inches long, dark green, often purple tinged. Ridges with a deep carinal groove and each angle with a row of flint dots. Stomata in one rowed series, each stoma connected with its opposite at top and bottom by a row of rosulæ, covered and nearly obsolete in old stems; sheaths short, tight, green at first except black at base of teeth, developing a broad black band above; basal sheaths often all black; old sheaths becoming cinereous at top. Leaves 4 to 6 angled; teeth broad, rigid, not articulated, erect, persistent, black with a broad or narrow, often deciduous border, 4 to 6 angled, the carinal groove very deep, tipped with a rough, black, deciduous awn. Upper sheath broadly campanulate, black, with about 10 very broad, 4 to 8 ribbed leaves; spikes nearly sessile, half an inch long, usually black, with a very large apiculate point, the sporophylls often deciduous, leaving the axis naked after spores. Spores ripe in July and August; centrum 1-3 to 1-2 the diameter of the stem, vallicular bast stout, 3 to 5 cells broad, meniscus-shaped, reaching the central cavity, the carinal pointed, of about equal height. The green parenchyma continuous under it. Anatomy similar to typical *variegatum*.

From Washington, by springs, Columbia River, *Suksdorf*, 2099, to British Columbia at New Westminster, on wet sand and silt, *A. J. Hill*, and Sicamous, on rotten mossy logs and in bogs with *Philonotis fontana*, *M. J. Finlayson*, east to Selkirk Mountains at Glacier, Canada, *W. M. Canby*, northward to Alaska, where it was abundantly collected by members of the Harriman expedition in 1899 at Muir Inlet, Glacier Inlet, Disenchantment Bay, Hidden Glacier Inlet and Russell Fiord. Khantaak

Island, *Funston*. Aounlaschka, *Applegate*. Nabesna River, *Schrader & Hartman*.

3. *Variegatum genuinum*. Stems caespitose, ascending or erect, $\frac{1}{2}$ to $1\frac{1}{2}$ lines in diameter, 6 to 10 inches tall, dark green, 5 to 10 angled, the keels deeply grooved in the center, each lateral ridge bearing a regular row of tubercles, grooves with regular bands of rosulæ between the stomata, one at each end and one half way between; sheaths short, a little widened above, the leaves strongly grooved in the center, the edges elevated, thus becoming 4 angled, green with a narrow black limb which often spreads late in the season, the lowest sheaths becoming black, this again often turning ashy the second year. Teeth persistent, erect, with wide hyaline borders, deeply centrally grooved, 4 ribbed, with divaricate, fuscous, rough, deciduous awns; spike sessile in the large upper sheath, strongly apiculate. The centers of the teeth often fade, and become hyaline like the margins. The black bands of the sheaths and the white margins of the teeth are quite striking on the green stems and give the plant its name.

Central hollow 1-3 the diameter of the stem, little larger than the vallecular. The vallecular bast is strongly developed and separates the green parenchyma; the carinal bast about equals the vallecular and the parenchyma is continuous under it. The green is thus of a Y shape, as in *laevigatum*, which the anatomy of this strongly resembles save for the small centrum.

Found around the Northern Hemisphere in cold temperate and Arctic regions. Very common in Northern Europe in several varieties. Our plant is almost exactly like what is considered to be typical in Europe. In America it extends from 41.30 degrees to about 80 degrees. It was found in a stunted, unfruitful form by Greeley at Lady Franklin Bay. The southernmost point from which I have seen it is Connecticut. It has been seen from Maine, N. H., Vt., N. Y., Yellowstone Park and several localities in Canada. Alaskan specimens do not quite agree with this, but are not varietally distinct. Abundantly reported from California and neighboring States, but the many specimens seen by me belong to other species. It may be found in mountain meadows, but hardly elsewhere. This plant is rarely found in sand and apparently never far from water. According

to Milde it prefers rich grassy places, the borders of mountain streams and swamps, and may even be found in company with *E. fluviatile*. Few American collectors give field notes. Fernald and I found it on gravelly river banks, Engelmann on wet rocks, and Canby's specimens contain *Eleocharis*, *Cyperus*, etc., showing that they were collected in a swamp. Milde says the stems are promptly killed by frost except where protected. I have been unable to learn from collectors if this is so, but a study of specimens shows but very few, mostly short, fragmentary stems of the previous year. Fernald's specimens from Ft. Fairfield, Me., collected in August, have a few of these fragments that have branches near the top, all turning yellow as if ripening. Evidently it is exceptional that stems live over.

4. *Nelsoni* var. nov. Stems tufted, $\frac{1}{2}$ to 2 feet high, mostly less than a line wide, erect or ascending, annual, 8 to 12 angled; ridges rounded, with cross-bands of silex; grooves with rosulae scattered or in bands connecting the ends of the opposite stomata. Sheaths amplified in dry plants collected early, through excessive shrinking of the node. In a wet state or in fresh specimens they are cylindrical, twice as long as broad, all green in young plants; the basal become black and a black band appears on most of the rest, this working downward asymmetrically and light patches appearing as they die; leaves grooved in center, often 4 angled. Teeth black and grooved centrally, broadly hyaline bordered, ending in filiform deciduous points equaling them in length; centrum about 1-3 the total diameter, the section being very similar to the last. Almost exactly between *Jesupi* and *laevigatum* with which it grows associated along a canal at East Chicago, Ill., N. L. T. Nelson. Also at Indiana Point and South Chicago, Shull. Nelson's plants grew in sand, as did Shull's from Indiana Point. The South Chicago specimens grew in a swamp among *Scirpus*, *Eleocharis*, *Carices*, etc., in a wet loamy soil. Sandy shore, Manistegue, Mich., J. H. Shutte, August, 1887. Banks and gravelly flats of West Canada Creek, Herkimer, N. Y., Dr. J. V. Haberer.

In the abundance of specimens sent by Mr. Nelson, collected in June, I did not find a vestige of old stems. Among those collected by Mr. Shull in November, I found many in process of dying from top downward, and I think none of them would survive the winter.

This is possibly variety *concolor* of Milde, which was accredited to "wet rocks, Niagara Falls, Dr. Engelmann, August, 1856," but it does not agree well, and the name is preoccupied. It is a good sub-species, and were it not for the fact that the group is so variable would be entitled to specific rank.

EQUISETUM SCRIPPOIDES MICHX.

Stems densely cespitose, 10 to 100 in a tuft, naked or slightly branched from base, green, smoothish, very slender, $\frac{1}{2}$ line in diameter, 2 to 12 (mostly 4) inches long, prostrate or ascending, falsely 6 to 8 carinate, the internodes usually curved or wavy; carinae mostly 3, rarely 4, broadly concave, equaling the valliculae in width, bearing a regular row of tubercles on each side, otherwise naked; valliculae with two regular rows of stomata, the cells between bearing scattered rosulae; sheaths loose, with 3 or 4 leaves, green, with a narrow black limb, usually becoming entirely black or brown; leaves with very broad central and lighter lateral grooves, thus being 4 angled. Teeth grooved and black centrally, broadly white bordered, persistent or becoming broken off, not coherent, with more or less persistent subulate points; spikes 2 lines long, of 5 or 6 whorls of sporophylls, black, sessile or slightly exserted from the broad upper sheath, formed in summer and sporiferous the following May. Central cavity absent, the carinae and their bast forming a trefoil at the center; vallicular cavities large, often filled with loose parenchyma. Green parenchyma continuous and abundant, the epidermal bast forming a narrow band instead of being accumulated at the carinae and valliculae.

A very striking plant which is doubtless often overlooked because of its small size and resemblance to fine grasses and carices, with which it is often mixed. It is more readily found in fall and spring when the grasses are brown. The wavy or curved internodes are very characteristic, the lower being often nearly straight, while the upper bend in a half circle; the tops of the stems being often S-shaped.

The stems often become prostrate and covered with decaying leaves, when they send out branches similar to themselves. It is the only species where the branches have as many angles as the stem. No other species of the sub-genus lacks a central hole, except *Variegatum anceps*.

An external examination of the stems shows them to be 6-angled, while there are but three leaves. When examined with a microscope they are found to be in reality but 3-angled, the three carinal holes alternating with the three vallecular, the spaces between the two rows of tubercles being without stomata or other marks, while those over the vallecular holes bear two regular rows with rosulæ in the interspaces. I have seen no 4-angled American specimens.

By the Rochester Code this would become *E. tenellum* (Lilj.) as Liljeblad's *E. hiemale tenellum* antedates Michaux's *scirpoides* by five years, but it does not seem expedient to do away with its appropriate and well-known name on such grounds.

It grows usually in rich wet humus, even on decayed logs, on wooded banks, often under hemlocks, amongst fine grasses, which it resembles. It does not grow in dense shade under large plants. It is confined to forest and mountain regions of the Northern Hemisphere from 40 degrees northward, and is very common in the northern part of its range. No varieties have been found, a remarkable fact in a plant of such great geographical distribution.

NEW OR RARE FERNS FROM THE SOUTHWEST.

BY WILLARD N. CLUTE.

In his endeavors to secure a complete collection of the native North American ferns, Mr. James H. Ferriss has made several trips to the Southwest, and although he has mainly collected the plants not represented in his collection, he has also found time to make herbarium specimens of any striking fronds that presented themselves. Having turned these over to me for naming, he has enabled me to make the following additions to the fern flora of the United States:

PELLAEA ASPERA.—In Eaton's "Ferns of North America" it is stated that "this fern has not been collected in more than twenty years and is rare in herbaria." It has apparently been found in greater abundance recently, for Mr. Reverchon and Mr. Bush record it from several stations and Mr. Ferriss found it common in Southwest Texas. With his specimens he included a form with shorter and more compact fronds, with close set pinnae

and pinnules which may well be known in future as forma *compacta*.

ADIANTUM TRICHOLEPIS.—Specimens of an *Adiantum* were collected near the mouth of the Pecos river and referred to *A. tricholepis*. The specimens differ, however, in being absolutely glabrous, though almost exactly like *tricholepis* in other respects. No doubt this will be given specific rank as soon as it becomes known to fern students, but until I have greater proof of its distinctness from *A. tricholepis* I prefer to consider it a form of that species and would call it *Adiantum tricholepis* forma *glabrum*. It may be characterized as follows: Fronds scattered thin in texture, stipes 6 to 10 inches long, glabrous, dark brown; blade ovate-lanceolate, 10 inches or more long, tri-pinnate below, and twice pinnate nearly to the apex; pinnules $\frac{1}{8}$ to $\frac{3}{8}$ of an inch wide, glabrous with a cuneate base and rounded three lobed margin, short stalked; sori long and narrow, about three on a pinnule. Type specimen in the author's collection. The pinnules of the specimen figured in Eaton's "Ferns" are rounded or truncate at the base, while our specimens are distinctly wedge-shaped. Mr. B. D. Gilbert, however, kindly compared the specimens with the specimens of *tricholepis* in the National Herbarium and assured me that the two agree in every particular except pubescence.

CHEILANTHES MORITZIANA.—In Eaton's "Ferns" there is an excellent figure representing the plant usually collected in the Southwest as *Cheilanthes microphylla*. The frond is long and very narrow, and is described as usually bi-pinnate with the pinnules pinnately incised. The author also notes that "a few specimens of a frond with sub-deltoid and nearly tri-pinnate fronds were collected on the Mexican Boundary Survey, the precise locality not known," and the description of the species is manifestly cast to include these forms. This sub-deltoid form, however, is very common in some sections, and Mr. Ferriss reports that it grows in quantities with the better known form without intergrading in the least. To the eye the two are very distinct and each can be distinguished as far away as the genus can be recognized. It was plentiful at San Marcos, New Braunfels, Devil's River and other places in Texas. Our specimens differ from the true *microphylla* in having the base of the frond two-

thirds as wide as the frond is long, making the outline triangular. There are about ten pairs of pinnæ as against the fifteen or more pairs in *microphylla* and the lower pinnæ are tri-pinnate with deeply lobed pinnules. All of this convinces us that this is the *Cheilanthes Moritziana* of Kuntze and it is therefore proposed that it be admitted to our fern flora and no longer regarded as a form of *C. microphylla*. The specimens agree perfectly with the figure of *C. Moritziana* in "Species Filicum," Vol. 2.

**A PRELIMINARY LIST OF PTERIDOPHYTA COLLECTED
IN DADE COUNTY, FLORIDA, DURING
NOVEMBER AND DECEMBER, 1903.**

BY A. A. EATON.

Having been sent by the Ames Botanical Laboratory to collect orchids in South Florida in November and December last, I improved the opportunity to make a collection of ferns and their allies, and was rewarded by several very good finds, enriching our flora by the addition of several species new to the United States and the rediscovery of some others which have been considered quite rare. Besides those given below, there are a few which are yet in doubt, some of them probably undescribed.

I was accompanied on part of my trips by Dr. John K. Small and Mr. Joel J. Carter, and on others by Mr. Chas. T. Simpson and Mr. John Soar. To the latter gentleman, a nurseryman of Little River, Fla., I am indebted for some of the best finds, and to Mr. Simpson for *Odontosoria clavata*. Mr. Soar took pains to collect living plants of all the ferns found, and people desiring such would do well to communicate with him. A fully annotated and illustrated list is in process of preparation at the Ames Botanical Laboratory.

Acrostichum aureum L. Brackish mangrove swamps.

Acrostichum lomarioides Brackish and fresh mangrove swamps.

Adiantum tenerum Swartz. Lime-sinks in hammocks.

Aneimia adiantifolia Swartz. Rough lime-rock, mostly not far from the borders of the woods.

Aspidium trifoliatum Sw. Lime-sinks in hammocks, 10-14 miles south of Cutler.

ASPLENIUM BISCAYNIANUM (D. C. Eaton.) (*A. rhizophyllum*

Biscaynianum D. C. Eaton). Fully entitled to specific rank. Abundant on limestone bluffs, back of a mangrove swamp at Punch Bowl, Miami. Half-way between the next two, with which it grows.

Asplenium dentatum L. Lime-rock walls and large sink-holes.

Asplenium myriophyllum Presl. Similar places to the last, but mostly in small sink-holes. Found *with* the last only at the Punch Bowl.

Asplenium serratum L. In several hammocks from Miami to 25 miles south.

Blechnum serrulatum Richard. Mucky hammocks on the border of the Everglades.

Isoetes flaccida Shuttlew. In shallow water and moist soil on the border of the Everglades. Not common.

Lycopodium Carolinianum L. Wet sand near a swamp. Ft. Lauderdale.

Lycopodium Chapmanii Underw. Wet sand. Ft. Lauderdale and Miami.

Meniscium reticulatum Sw. On cypress-knees in a swamp bordering the Everglades at the Miami water works, Alapattah. Heretofore known from North America only from a few pinnæ collected in June, 1903, in a cypress-swamp on the west coast by J. E. Layne. This, after *Acrostichum lomarioides*, is our largest fern, reaching 9½ feet in height and 3 feet in breadth of frond. The largest pinnæ bear proliferations at base that sometimes bear fruiting fronds.

Nephrodium amplum Baker. This very fine fern, which might be classed with the tree ferns on account of its stout caudex ½ ft. high, I first found at Costello's hammock, 12 miles south of Cutler, when in company with Dr. Small and Mr. J. J. Carter. It had been found there the previous day by Messrs. Soar and Simpson, who had tried to connect with our party. We later found it in Ross' hammock and in a smaller one two miles further north.

Nephrodium reptans Diels. (*Phegopteris reptans* Sw.). Lime-sinks of all the hammocks in the pine-woods, 12-14 miles south of Cutler. This has the venation of *Nephrodium molle* and nearly always has a fringed indusium. As the genus *Phegopteris* is founded on the *absence* of indusium, it seems best to place this species in *Nephrodium*.

Nephrodium Thelypteris Desv. Uncommon. Wet places bordering Everglades.

Nephrolepis acuta Presl. On the ground and palmetto trees, in low hammocks. Sometimes 12 ft. tall. Common.

Nephrolepis exaltata Schott. On the ground and palmettos in hammocks.

Odontosoria clavata J. Sm. (*Davallia clavata* Sw.). In sinks in low pine woods, 12-20 miles south of Cutler; also in an old well at Buena Vista.

Ophioglossum palmatum L. About six plants on a palmetto tree in Snapper Hammock, 10 miles south of Miami. The only specimens found.

Ophioglossum pusillum Nutt. In damp sand at Little River and Ft. Lauderdale.

Osmunda regalis L. Cypress-swamps and low hammocks.

Polypodium aureum L. On trees, mostly pamottos, rarely on the ground; abundant.

Polypodium angustifolium Sw. On trees, principally live-oak, in a hammock 14 miles south of Cutler. Previously collected in the United States only by J. A. Layne, in the spring of 1903.

Polypodium incanum Sw. Abundant.

Polypodium pectinatum L. On trees and logs in a hammock 14 miles south of Cutler.

Polypodium Phyllitidis L. On trees and the ground in hammocks.

Polypodium Swartzii Baker. On small trees in a hammock east of Brown's homestead, 14 miles south of Cutler. Previously reported only from Key Largo.

Psilotum triquetrum Sw. Not uncommon on decaying wood, etc., often in holes in living trees.

Pteris caudata L. Common.

Pteris longifolia L. Common in rough lime-rock in open places.

Selaginella arenicola Underw. Sandy pine woods at Alapattah.

Trichomanes Kraussii, Hook. & Grev. On roots and small tree-trunks in humid hammocks, 10-20 miles south of Cutler.

Trichomanes sphenoides Kunze. In lime-sinks, hammocks, 10-15 miles south of Cutler

Vittaria lineata Sw. Abundant on palmettoes.

Woodwardia Virginica Smith. Sandy cypress-swamp at Ft. Lauderdale.

Ames Botanical Laboratory, N. Easton, Mass.

POLYSTICHUM ACROSTICHOIDES AND SOME INSECTS THAT INFEST IT.

BY AUGUSTA SCHENCK KALBFLEISCH.

To the frequenter of the woods and hills our native Christmas fern (*Polystichum acrostichoides*) is no doubt a familiar object, but those who have never studied it closely, beneath the microscope, little dream of the minute insect life hidden among its sporanges.

Its range is quite wide, and however abundant it may be in rocky soil, on the banks of the Hudson and elsewhere, it nevertheless grows in profusion on Long Island in rockless woods under the shade of great chestnuts and oaks. But it invariably selects hilly ground as its home and I have never found it distant less than three miles from the salt water. It is most sociably inclined and large patches of it are seen beside the hay-scented fern (*Dicksonia filosisuscula*) and silvery spleenwort (*Asplenium acrostichoides*.)

The fronds arise in dense clumps from the stout, creeping root stock, which runs horizontally through the ground a little below the surface, and one would never imagine its firmness, until a vain attempt is made to dislodge it. The stipe, brown and chaffy, is from 3 inches to 7 in length. The leaves are from 6 inches to 2 feet long and 2 to 3 inches wide; lanceolate, once pinnate, smooth, evergreen and coriaceous. The pinnae are somewhat halberd-shaped and toothed. The fertile and sterile leaves are similar in form; the fertile, however, are contracted toward the summit, while the sterile fronds are rather abruptly pointed. The indusium resembles a small, brown, flattened bladder and encloses from 12 to 15 sporanges which are scattered when the indusium breaks. The sporanges are round with a vertical ring which bursts transversely and releases the great mass of spores, which are small and white. Each sporange is furnished with a pedicel about three times its own length.

The sori are arranged upon the under side of the pinnæ, a row or sometimes two rows on either side of the mid-vein, at length covering the entire under surface of the leaf, from a little above the middle to its summit.

It was while studying these sori under the microscope that I became aware of the presence of some tiny insects moving busily about among the spores, and last summer, until their disappearance at the approach of frost, they were the object of my constant observation. They are to be seen again this season on the same ferns, so that their appearance cannot be attributed to chance conditions. Needless to say these mites are invisible under an ordinary magnifying glass, and even under the microscope they seem but ill constructed little beings at most, and their activity renders them most difficult of study. I have observed apparently two forms, one which seems to be the general type both in size and shape, and another much larger and resembling a small beetle armed with crab-like claws. The body of both is greenish white, semi-transparent, with the metallic shadings of a piece of Tyrian glass. In the former type the head is misshapen and humpy, the body oval, furnished with 4 pair of legs all having an unjointed, vegetable look.

Their chief occupation seems to be burrowing under the sporanges and in carrying the spores about. This I have watched them do for several minutes, but although always apparently bent upon the accomplishment of some object, I have never discovered precisely what that object is. They pick up the spores, carry them for a short distance, then drop them and pick up others. They are always carried either in the two front feet or the posterior pair, a spore on each foot, elevated above the body, and they move them about like a pair of boxing gloves, which, in fact, they strongly suggest. I have fancied that they may feed upon the pedicels of the sporanges which I have noticed are absent on the pinnæ of the leaves upon which I find the insects. However this may be a coincidence. I shall be much interested to learn the name of this particular mite and something more concerning it. Can some one give me the desired information?

I have never found a trace of its presence upon any other species of fern or in fact upon any other plant, although I have searched for it in many likely places. Another rather strange

fact is that it is evidently not common to *Polystichum acrostichoides* everywhere, as I only find it on the ferns of one locality. *Babylon, N. Y.*

FERNS OF ANN ARBOR, MICHIGAN.

BY STEWART H. BURNHAM.

While in attendance at the University of Michigan from 1897 to 1899, I found a little time to study the flora of the surrounding region, particularly during the last school year. The native flora is rapidly passing away and to-day is largely confined to small wooded areas and fence-rows. The virgin deep woods, visited—woods that are so typical in New York State and New England, can readily be counted. The woods are usually open and would more correctly bear the name of "woodlands." The soil being gravel, brought down by old glaciers, dries out quickly, hence many of our moisture loving plants, as ferns, do not find a congenial home here.

The T. & A. woods, three miles south, by the Toledo and Ann Arbor Railroad, is the only typical wood near the city. The soil is rich and the ground often wet and marshy, affording the right conditions for many ferns. Here in company with the fragrant *Phlox divaricata*, *Claytonia*, *Cardamines* and the rare *Aplectrum*, grows *Adiantum pedatum*, *Polystichum acrostichoides* and the variety *incisum*, *Nephrodium spinulosum intermedium*, *N. spinulosum* approaching *dilatatum*, *Athyrium filix-foemina*, *A. acrostichoides*, *Onoclea struthiopteris*, *Botrychium Virginianum*, and *Lycopodium lucidulum*.

About the Three Sister Lakes, three miles west of the city, small bodies of water surrounded on all sides by gravelly rolling hills, is another excellent collecting ground, particularly about the most eastern lake, which is surrounded by a quaking tamarack bog. Here may be found *Nephrodium cristatum*, *N. thelypteris*, *Osmunda cinnamomea*, *O. regalis*, which was distorted by a fungus, and *Onoclea sensibilis*, in company with *Sarracenia*, *Pogonia*, *Calopogon* and *Triglochin*.

Along the Huron river in wooded ravines running back from its banks may be found some of our more uncommon fern allies. *Selaginella apus*, which closely resembles the mosses with which

it grows, *Equisetum hyemale*, with lateral branches. *E. arvense*, and *E. laevigatum*, the latter growing in a calcareous bog up the river. *Cystopteris bulbifera* and *Pteris aquilina* are found at Cascade Glen.

Miss E. C. Almendinger in her list of Ann Arbor plants (1876) adds: *Equisetum sylvaticum* (rare), *E. fluviatile*, *Woodwardia Virginica*, *Asplenium angustifolium*, *Phegopteris hexagonoptera*, *Nephrodium cristatum Clintonianum*, *N. noveboracense*, *Cystopteris fragilis*, *Osmunda Claytoniana*, *Botrychium obliquum* and *B. obliquum intermedium* (very rare), Miss Clark, 1863.

At no time do I ever remember of seeing *Nephrodium marginale*, our common wood shield-fern. Its absence from this flora is very striking, when one considers how common it is in the northeastern United States. In Michigan it is said to be only frequent north of the central part of the State. Many other common ferns are wanting. This is particularly true of all rock-loving species, as one very rarely finds an exposed rock surface.

RAYNAL DODGE.

It is seldom that a student of ferns engaged for most of his waking hours in commercial pursuits is able to add so much of importance to fern study as has the gentleman whose portrait appears in this issue—Mr. Raynal Dodge of Newburyport, Mass. It is to his activity that we owe not only the discovery of *Nephrodium simulatum*, but also of that curious hybrid, *Nephrodium cristatum X marginale*.

Mr. Dodge is of Puritan ancestry, his family having settled in New England in 1627. He was born in Newburyport, Mass., September 9, 1844. Upon his graduation from the local high school he enlisted in the army and served through Banks' campaign in Louisiana. He was wounded at the siege of Port Hudson, June 28, 1863. Returning to his home he took up the trade of machinist, in which he has continued to the present.

His little book, "The Ferns and Fern Allies of New England," has made his name familiar to all American fern students. In this book he published the first illustration of *Nephrodium simu-*

latum ever issued. The book also contained a list of the ferns and fern allies arranged according to their time of fruiting in New England, which required long and careful observation to produce. He was also the discoverer of the fact that the external covering of the macrospores in *Isoetes* is almost pure silica.

During recent years Mr. Dodge has paid a great deal of attention to general botany and has frequently delivered lectures on such subjects as "Ferns," "Weeds," "Poisonous Plants," etc., in his own and neighboring towns. In his investigations of the genus *Isoetes* he discovered *I. Eatoni*, and another species was named in his honor.—*W. N. C.*

FERN VARIETIES.

If I may once more claim a little space in vindication of the study of varieties, I should like to add a few words to my thanks to the editor for his fair and square expressions of his point of view, though it fails to convert me. In the first place I think the editor should keep an open mind and consider that among the many members of the Fern Chapter tastes may vary and furthermore that in studying any branch of natural knowledge it is well to take *all* observed phenomena into consideration and not exclude a certain set upon the gratuitous assumption that they are "due to the slipping of a cog somewhere in nature's machinery." One of the burning questions of the day among botanists is the cause of variation in plants and some of the more eminent European botanists are beginning to believe that sports may have played a material role in the evolution of species. Another question is the relative variability of plants under natural conditions and under cultivation, and in this particular connection I may refer your readers to an article of mine in the *Gardener's Chronicle* of Dec. 19, "Variations Wild and Cultural," which is based entirely upon the 50 odd years' experience gathered by our British fern hunters and constantly recorded. Here then we perceive that this very study which is deprecated in unmistakable terms, is likely to prove a scientific factor of great value, since absolutely no other family of plants has been studied for so long or so thoroughly so as to form a reliable mass of data bearing on the point at issue. I may also point out that it is precisely due to

the deeper scientific study of these "sports" that the hard and fast line supposed to exist between oospore and sporophore, i. e., prothallus and fern proper, has been broken down and every conceivable variant of the life cycle shown to exist. I think I may possibly claim to have largely contributed to these results by the discovery of apospory and by calling the attention of scientific botanists, most of whom took up, until then, the position maintained by the editor to other phenomena presented by these much condemned "sports." I am now frequently called upon to provide material for further research by some of our foremost botanists who have now quite adopted the view that there is much to be learned from nature's exceptions.

So much for science. Now for the æsthetic side of the fern question. A large number of these sports are admittedly far more beautiful than the normals. Why then should this aspect of the case be ignored? Unfortunately I cannot send you a photograph of my fernery, but one appears in the little book you received, "The Book of British Ferns," and I would ask anyone with a sense of beauty whether the world is not enriched by such a collection, due entirely to assiduous fern variety hunters and raisers and which could not have existed under the ignoring conditions of the editor's criticism.

Finally, I must take exception to the parallel of the freaks in animals and sports in plants. Animals, owing to their far higher development and more complete organization, cannot "sport" on similar lines to plants, so as to permit such a parallel to be drawn. Polydactylism, it is true, may occasionally appear in animals and even be inherited, so I must concede the "seven-toed kitten" idea for what it is worth. That of the two-headed rabbit, however, comes under an entirely different category and is in more ways than one a misconception. A plumose parallel perhaps exists in the merino "sport" in sheep, but this branch of the argument is scarcely worth pursuing, as I am quite contented to base my "mania" on the preceding grounds alone and trust that some at any rate of the Fern Chapter will range themselves under my banner rather than that of the editor to whom, however, I throw down my gage in all amity.—*Chas. T. Druery, F. L. S., V. M. H., Acton, London, W., England.*

[The editor concedes all that Mr. Druery says in regard to the value of these abnormal ferns for scientific study. Indeed,

this view of the case is exactly the one prevailing among scientific men on this side. Nearly always the normal is easily explained by the abnormal. But as to considering these poor mis-shapen fronds as more beautiful than normal specimens—*never!* Does not Mr. Druery consider the dark glossy fronds of the normal hart's-tongue, strap-like though they be, much superior in looks to any of the lobed, forked or frizzled specimens that have been evolved from them by cultivation? However, the collection of these freaks is a harmless pastime and one we could not condemn entirely if we would on account of similar practices here. We do not go in for abnormal fronds, but has Mr. Druery noticed our great delight in multiplying "species" in *Scelaginella*, *Botrychium*, *Lycopodium* and *Isoetes*? To object to the British view of fern culture would be another case of the pot calling the kettle black.—Ed.]

ADDITIONAL LITERATURE RELATING TO THE FLORA OF LOUISIANA.

In the issue of the FERN BULLETIN for January, 1903, you refer to a list of the flowering plants and ferns of Louisiana by Prof. A. Featherman which was never published. In 1871 Prof. Featherman published his "Flora Ludoviciana" in Report of Botanical Survey of Southern and Central Louisiana, made during the year 1870, pp. 71-129; and in Third Annual Report of Botanical Survey of Southwest and Northwest Louisiana, made during the year 1871, pp. 142-161. Other works which are not mentioned by you are:

TORREY, JOHN.—Description of the plants collected during the expedition, in Marcy's Exploration of the Red River of Louisiana in the year 1852, pp. 277-304.

ALBRECHT, J.—List of native woody plants grown in Louisiana, in Report on Forests of Louisiana in 1884.

MOHR, C.—Die Walder der Alluvial Region des Mississippi in den Staaten Louisiana, Mississippi und Arkansas. Pharm. Rundsch, xiii, 1895, pp. 14-15, 30-33.

LLOYD, F. E. & TRACY, S. M. The insular flora of Missis-

sippi and Louisiana. Bull. Torr. Club, xxviii, 1901, pp. 61-101.—*Mary A. Day, Gray Herbarium, Cambridge, Mass.*

[The list of works given in the "Fern Flora of Louisiana" was meant to bear especially on the ferns, but we are glad to have these additional citations of lists that in most cases cover the flowering plants as well as the ferns. In this connection it may be said that we hope the authors of the various fern floras will assist us in keeping them up to date, both as regards published articles on the subject and the discovery of additional species. It is planned to publish a list of additions from time to time as material accumulates. Already we have two or more species to be added to some of the floras published.—Ed.]

DESTROYING THE FERNS.

Those who patronize the florists have no doubt been impressed with the important part ferns play in the make-up of bouquets and other decorations, and have perhaps imagined that the fern fronds were grown in the greenhouses with the flowers. Such, however, is not the case. The thrifty cultivator uses all his space for flowers and depends upon Nature for his ferns. Orchids, carnations and roses must be grown under glass, but the hillsides of the northern States are covered with ferns, that, up to the present, could be had for the gathering. This has resulted in the development of an extensive traffic in fronds of our native ferns, which is beginning to threaten their existence in the regions from which the supply comes.

To prevent the total extinction of the ferns in the Berkshires a measure has been introduced into the Massachusetts Legislature requiring that each fern-gatherer in that State have a license and making other regulations for restricting the collecting. This, of course, has aroused the strong opposition of the dealers. From the *Pittsfield Evening Journal* of January 20, we take the following which sets forth the collector's side of the case:

"Hinsdale is aroused over the bill that Representative Allen T. Treadway, of Stockbridge, has introduced into the House of Representatives relating to the fern industry in this country. If this bill passes the House the industry will be killed in Berkshire so say the dealers and they are going to put up a stiff fight to de-

feat it. Not more than \$50,000 worth of ferns are harvested in Berkshire every year and if the business is killed it means that the chief source of income for scores of families will be abolished. As showing the extent of the industry John Abbott, of Hinsdale, buys more than \$10,000 worth each year. L. B. Brague does an equally large business and there are several more in and about Hinsdale.

"It is estimated that more than 100,000,000 ferns are gathered each year and put in cold storage at Springfield to be sent broadcast over the country. From all over the country come in the farmers with their great loads of ferns, some of which bring as high a price as \$2.50 a load. For the past twenty years dealers in Hinsdale have been in the fern business and they say there has not been the slightest diminution in the supply.

"All the year up to the time of frost in the autumn, farmers have their entire families out getting ferns; ferns of all descriptions from the delicate maiden-hair to the austere brakes. The roots are always saved and in many cases land that is of no value for other purposes brings in a good revenue from the ferns.

"The bill provides that the pickers must have a license to conduct their business and that a certificate must follow each lot of ferns from the time they are gathered in the woods of Berkshire until they reach the final purchaser in some large city.

"This red tape would kill the business entirely, the dealers say. It is said that Mr. Treadway has been prompted in this measure by summer residents of Stockbridge and vicinity. It is said that Italians coming up to Stockbridge have raised havoc with the beauty of woods in southern Berkshire and hence his wish to save them. A man interested in fern gathering said today that at least one-fourth of the people of Berkshire are directly interested in the fern business."

When a man owning a piece of land chooses to market the ferns upon it, or to allow others to do so, no one can object, for a man may do as he will with his own. If he decided to cut down his woodland, plow up the ferns and sow other crops upon the land, no one would criticise him. But the gathering of ferns from the lands of another without permission is quite another matter and the sooner the people of Massachusetts and other New England States put a stop to such practices, the better.

It is a mistake to think that removing the fronds, even in autumn, does no harm to the plants. Gathering the fronds late in the year injures the plants less than at other seasons, but it may be safely assumed that so long as the fronds are green the plant has use for them. Here seems to be a good opportunity for the plant protection societies to do some missionary work. Any person willing to exterminate our ferns at \$2.50 a wagon load ought to be converted.—*American Botanist*.

DODGE'S FERN.

The person who is continually using scientific names and who understands their meaning, is apt to decry the use of "popular" names for plants; and indeed it is a question if the amateur who uses them is not robbing himself, for he will often find plants that have no common names and he will be unable to speak of them intelligently. There is no good reason why the Latin names of ferns should not become as "popular" as *Dahlia*, *Fuchsia* and hosts of others that are in every day use. The writer of popular books is often hard pressed to supply this demand for "easy" names, and frequently complies by coining a word. An instance of this is seen in a recent work on ferns where *Nephrodium simulatum* Dav. is spoken of as the "Massachusetts fern." It strikes me this name is particularly unfortunate; first, because it was not discovered in Massachusetts, but at Seabrook, N. H.; secondly, it was brought to notice, as was the hybrid shield-fern, by Raynal Dodge, a close student of New England fern life, compiler of a manual of our New England Pteridophytes, and a good collector and observer, a man who has added much to our knowledge of plants in the little time allowed from the busy life of a machinist, and it should rightly bear his name. It is to be hoped that in future this will be spoken of not as the "Massachusetts," but as "Dodge's" fern.—*A. A. Eaton in American Botanist*.

In the *Ohio Naturalist* for November, the bracken is included in a list of poisonous plants upon the supposition that it is poisonous to horses and cattle.

A WEEDY FERNWORT.

A couple of years ago a correspondent in Northern Nebraska sent me a specimen of *Marsilia vestita* for name, with the statement that it was growing abundantly in one of his meadows, and that it was a weed which was giving him a good deal of trouble. I was much surprised, and investigated the matter somewhat carefully, and found that it was as he had said. There is no doubt that in his case *Marsilia* had spread out into a somewhat wet meadow, and that its luxuriant growth gave it the characteristics of a weed. I do not know of any case of this kind on record, and invite the attention of readers of the BULLETIN to this instance, asking for statements with regard to similar cases.—Charles E. Bessey, the University of Nebraska, Lincoln, Nebraska.

[Some of the other species of *Marsilia* have the same weedy characteristics mentioned by Prof. Bessey. In the City of New Orleans, *Marsilia uncinata* is common in ditches, and in the suburbs often grows entirely across the streets, making them look like fields of clover. Indeed, this species is so much like clover, that it often escapes notice on that account. The story is told of a certain southern botanist that happening in New Orleans he expressed a desire to see the rare *Marsilia uncinata*. His companion told him to look down at his feet, whereupon he found he was standing in *Marsilia* up to his shoe-tops. *M. uncinata* was long considered rare, but it has recently been found in abundance for 200 miles or more along the Mississippi.—Ed.]

CEROPTERIS TRIANGULARIS IN ALASKA.

Sometime ago a question was raised relative to the occurrence of this species, the Californian "goldback fern," north of Vancouver Island. I have a specimen collected at Cape Nome, Alaska, by Dr. F. E. Blaisdell in the summer of 1900, communicated by Miss Alice Eastwood of the California Academy of Sciences. The specimen consists of a single leaf of under-size, but is normal and unmistakable.—L. M. Underwood.

[The fern above mentioned is the species familiar to many under the name of *Gymnogramme triangularis*. All the other *Gymnogrammes* are tropical or sub-tropical species, and the occurrence of this one so far north is both curious and interesting.—Ed.]

INDEX TO CURRENT LITERATURE RELATING TO FERNs.

Readers are requested to call our attention to any omissions from this list.

BUCHHEISTER, J. C. *Variation in the Common Polypody*. American Botanist, S. 1903.

CLUTE, W. N. *A New Species of Equisetum*. Fern Bulletin, Ja. 1904.

CLUTE, W. N. *The Measurement of Variation in Equisetum*. Fern Bulletin, Ja. 1904.

COKER, W. C. *Equisetum Arvense*. Botanical Gazette, Ja. 1904.

DE COSTER, MRS. H. A. *Fern Hunting in Little Falls, N. Y.* American Botanist, Ag. 1903.

DEARNESS, J. *The Fern Flora of Middlesex County [Ontario]*. Guelph Herald, F. 19, 1904.

EATON, A. A. *Dodge's Fern*. American Botanist, D. 1903.

EATON, A. A. *The Genus Equisetum in North America*. Sixteenth Paper. Fern Bulletin, Ja. 1904.

FETHEROLF, J. M. *Asplenium Ebenoides*. Fern Bulletin, Ja. 1904.

HILL, E. J. *Remarks on Some Fernworts of Western New York*. Fern Bulletin, Ja. 1904.

HOLM, A. B. *Linnaeus' Work on Ferns*. Torrey, D. 1903.

KLUGH, A. B. *The Fern Flora of Wellington County [Ontario]*. Guelph Herald, F. 12, 1904.

KLUGH, A. B. *Treasure Trove*. Fern Bulletin, Ja. 1904.

MAXON, W. R. *A Fern New to the United States*. Torrey, D. 1903.

McCALLA, W. C. *The Fern Flora of Lincoln County [Ontario]*. Guelph Herald, F. 26, 1904.

PARISH, S. B. *The Fern Flora of California*. Fern Bulletin, Ja. 1904.

SCOTT, P. J. *The Fern Flora of the Bruce Peninsula*. Guelph Herald, Ja. 22, 1904.

WHITE, J. *The Fern Flora of Peel County [Ontario]*. Guelph Herald, F. 5, 1904.

——— *Ferns as Weeds*. American Botanist, N. 1903.

——— *Destroying the Ferns*. American Botanist, D. 1903.

EDITORIAL.

At the present writing the January number of this journal has not been issued, though we are glad to say that it is printed. It was first delayed intentionally in order to include a report of the St. Louis fern meeting, and subsequent delays have been due entirely to the procrastination of the printers with whom we have a contract for printing the BULLETIN. As our readers are aware, the editor is away from home and this seems to be taken by the printers as an excuse for putting off until the day after to-morrow what should have been done yesterday. Now that the magazine is printed, a further delay has been occasioned by the loss in the mails, not only of the cut for the frontispiece, but of the photograph from which it was made. We are endeavoring to secure another cut and the number will be issued as soon as possible. Whether it appears before or after the April number depends entirely upon how soon we can get a new frontispiece. Fortunately the FERN BULLETIN has existed so long that any delay in an issue is not taken by the subscribers as an indication that the magazine is on the verge of failure. Nevertheless, we realize how exasperating such delays are to readers, and the pile of letters we have received complaining of the non-appearance of the magazine are potent reminders of the fact.

* *

The present number is intended to be issued on time—that is the copy for it was in the hands of the printer before the middle of March with instructions to push it as fast as possible. If it does not appear by the first week in April there will be some better excuse for the delay than the dilatory methods of compositors and pressmen.

* *

The eleventh annual report of the Fern Chapter just received shows as usual an increase of members over last year, and in addition a very respectable balance in the treasury. The Chapter has been for some years one of the largest of American botanical societies, and a membership in it has come to mean much more than it did when the society was in its infancy. In its early days the printing of additional fern literature for free distribu-

tion to members was an important feature of the Chapter work, but in recent years this has not been so conspicuous. It is gratifying to note, however, that the Chapter purposes to return to this feature and, having available for the present year nearly one hundred dollars, expects to publish the index to the first ten volumes of the FERN BULLETIN, and perhaps will also reprint the volumes of the magazine that are now out of print. In this connection it may be said that the editor has nearly ready a new and up-to-date list of the ferns and fern allies of North America which when published will probably be sent to members by an arrangement with the Chapter.

* *
*

For some years the Connecticut Chautauqua Assembly has held summer sessions near Plainville. Last year one of the speakers was Dr. E. F. Bigelow, formerly editor of the *Observer*, and a well-known lecturer on outdoor subjects. His course was so successful that the Assembly determined to found the "Bigelow School of Nature Study" with Dr. Bigelow as director, and to hold a session every summer. The session for 1904 will be held from July 13th to 27th, during which time four courses of eight lectures each on various phases of nature will be given. In addition there will be many other lectures of a more popular nature, many of them illustrated. This year is to be a "fern year" and the editor of the FERN BULLETIN expects to be present and in charge of the studies in cryptogams. Special attention will be given to methods of herbarium making, fern collecting, identifying, etc. Certain other studies in flowering plants will also be under his direction. At some time during the session it is proposed to hold a special fern meeting, perhaps under the auspices of the Fern Chapter. More than half the members of the Chapter live within a day's ride of Plainville and it is probable that this would afford the opportunity for a most enthusiastic gathering. There are a large number of special features connected with the work of the school that while not dealing especially with ferns, will be attractive to all fern students. For information on these points application should be made to the Connecticut Chautauqua Assembly, Hartford. Additional information about the fern meeting will be found in the July FERN BULLETIN.

We consider ourselves fortunate in being able to publish, in a single issue, two such important contributions to fern study as Mr. Curtiss' "Fern Flora of Florida" and Mr. Eaton's list of Florida Pteridophytes. Mr. Curtiss has to his credit the discovery of many of the Florida ferns known to collectors, but in his fern flora, written before Mr. Eaton's trip was made, expressed the opinion that there were other species yet to be reported. Mr. Eaton's trip resulted in the discovery of nearly a dozen more; but we feel perfectly safe in prophesying that still others will be found. The announcement that any West Indian fern had been found in Southern Florida would not surprise us. Within 200 miles of Florida and nearly in the same latitude are more than five hundred species of ferns. Spores of many of these must constantly rain down upon our southern boundaries. The wonder is that more species are not found. Mr. Eaton purposes to return to Florida in a few weeks, when we expect to hear of still further additions to the fern flora. In order to have the Florida fern flora up-to-date, we have inserted Mr. Eaton's finds in Mr. Curtiss' list in this issue.

* *
*

With the publication of the article on *Equisetum* in this number, the series of articles on "The Genus *Equisetum* in North America" comes to an end. It is safe to say that in the preparation of these articles the material has received a more careful examination than it is likely to get in a long time. The sets of specimens illustrating the text are therefore possessed of unusual value. One of the most interesting facts developed as this series progressed is that few hard and fast lines for limiting the species can be drawn. It is easy enough to identify typical plants, but most species include forms that might be named as varieties of some other species without violation of the proprieties. This ought to have a very important bearing upon the question of the origin of species.

* *
*

Last October we gave notice that our series of portraits of fern students would be discontinued for a while to make room for other matter, but it has since seemed advisable to add to the series the portraits of Miss Sadie F. Price and Mr. Raynal

Dodge. In closing the series for the present, we do not do so because of having exhausted the list. There are several more whose services to American fern study are important enough to warrant being included, and these we purpose giving at a later date. The beginners in fern study, however, are usually more interested in ferns than in fern students, and in recognition of this fact we shall now begin a series of portraits and biographies of the curious ferns of the world. The ferns selected for this series are those that are of special interest because of their shape, haunts, or habits.

NOTES.

In the *Torrey Bulletin* for December, Mr. W. R. Maxon records the occurrence of *Asplenium auritum* in Sumpter County, Florida. The record rests upon a single specimen collected by F. L. Lewton September 4, 1894. This fern is common in the West Indies, from whence the spore that gave rise to the Florida specimen was doubtless carried by the wind.

Prof. L. S. Hopkins, Troy, Ohio, recently sent us a photograph of a clump of *Pellaea atropurpurea* containing 108 green fronds and more than 300 stipes all so closely assembled as to appear like one plant. Our thanks are also due to Mr. Perley Dunn Aldrich, of Rochester, N. Y., for an excellent photograph of a colony of the walking fern by Prof. H. L. Fairchild. The plants form a solid mat on the vertical face of a cliff which, singularly enough, is of sandstone. The thrifty appearance of this colony shows very clearly that the plant does not languish when away from its favorite limestone.

BOOK NEWS.

Mr. C. F. Saunders' latest venture in a literary way is a book of poems entitled "In a Poppy Garden."* To many, the announcement that Mr. Saunders is a poet as well as botanist will be no surprise, for his verse has been appearing for some years in the better class of magazines. The present volume is a collection of these poems to which have been added several

new ones. All are written in the author's felicitous style and most of them have been suggested by various phases of nature, though in no sense are they mere descriptive pieces. An added charm is given the volume by the illustrations, one for each poem, drawn by the author's wife in pleasing harmony with the text.

"The Mountain Walks of a Recluse,"† by Rev. E. C. Burr, is a volume written by a scholar and poet about nature and man in the Hudson Valley. The chapters are in the form of letters to a friend who has left the country for the city, and contain the sort of matter that would be likely to interest others similarly situated. The author's quiet and contemplative life has afforded him the leisure for an acquaintance with nature in many of her rarer moods and of his observations the book is made.

*In a Poppy Garden. By Charles Francis Saunders. 12 mo. 45 pp. Boston, Richard G. Badger. 1904.

†The Mountain Walks of a Recluse. By Rev. E. C. Burr. New York, Broadway Publishing Co. 1903. 12 mo. 278 pp.

THE LINNAEAN FERN CHAPTER OF THE AGASSIZ ASSOCIATION.

—There are now 135 members in the Chapter.—C.

—We are promised the index to the first ten volumes of the FERN BULLETIN some time in August. By reason of the unique position and scope of the magazine the index is something more than a mere list of the articles published in it. It is, in fact, an index to the fern literature of the past ten years since the fern matter published in other journals was either reprinted or reviewed in it. In preparing the index Mr. Gilbert took special care to make all the cross-references necessary, and it promises to be an exceedingly useful publication for the fern student.—C.

—Although the FERN BULLETIN has always been the official organ of the Chapter, it has not been published by the Chapter since 1896. A few members, however, continue to send dues to the publishers. While they have no objection to acting as agents in the matter, members will hear from the Chapter more quickly if dues are sent directly to the Treasurer, Mr. C. F. Saunders, Secretary's office, Commercial Exchange, Philadelphia, Pa.

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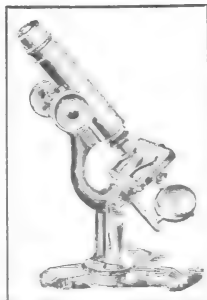
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Vol. XII.

No. 3.

The Fern Bulletin.

A Quarterly Devoted to Ferns.

JULY

Binghamton, N. Y.
THE FERN BULLETIN CO.
1904

THE FERN BULLETIN

A QUARTERLY DEVOTED TO FERNS

WILLARD N. CLUTE, Editor

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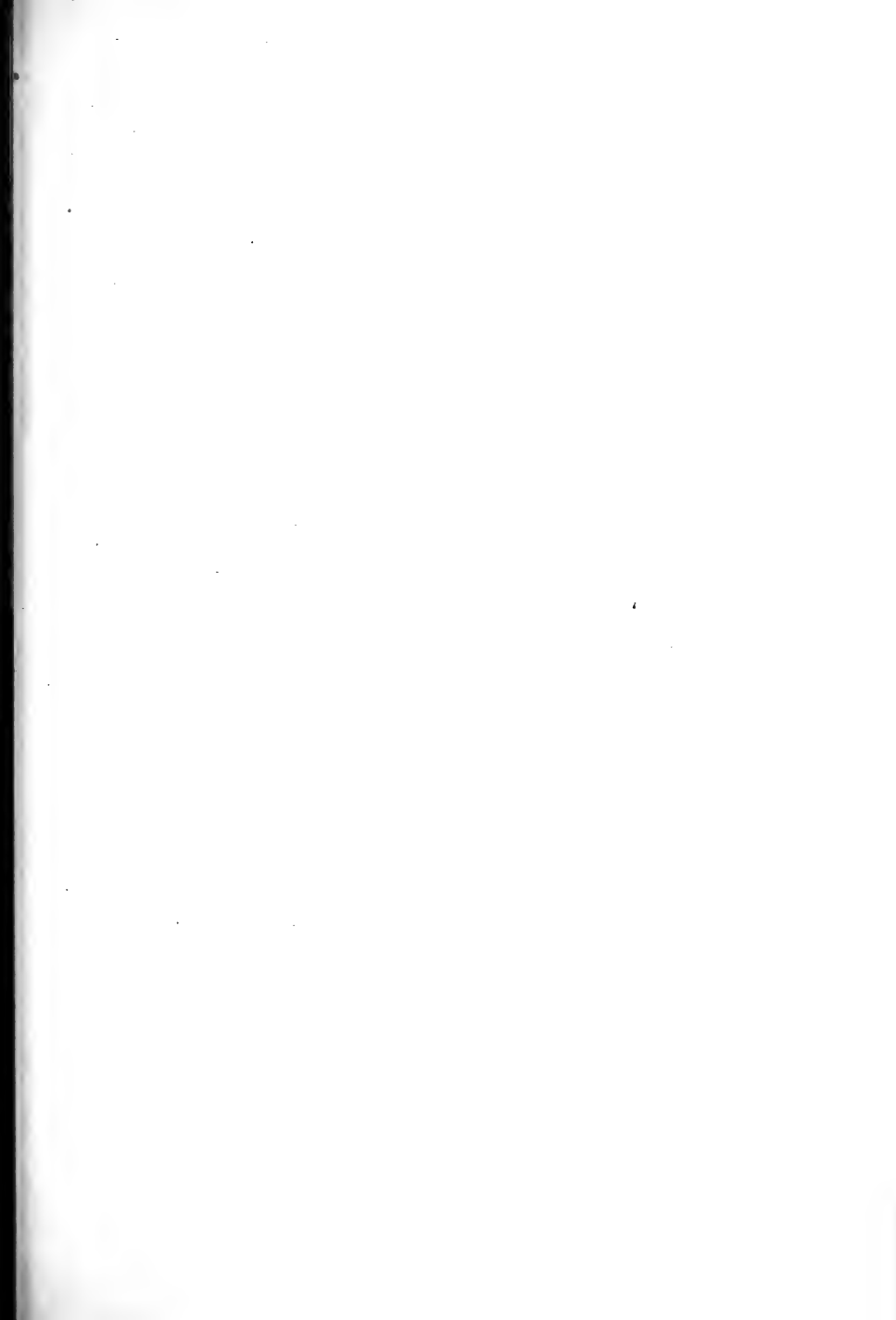
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HEMIONITIS PALMATA

THE FERN BULLETIN

VOL. XII.

JULY, 1904

No. 3

CONTRIBUTION TOWARD THE FERN FLORA OF KENTUCKY.

BY SADIE F. PRICE.

As previously announced in this magazine, Miss Sadie F. Price was selected to write the fern flora of Kentucky in the series of fern floras now appearing. Her death occurred before the completion of the article, but from her notes the following list has been prepared. We shall be glad to receive further additions to this list.

OPHIOGLOSSACEAE.

Ophioglossum vulgatum L. ADDER'S TONGUE. Very common in the southern part of the State, growing in rich woods under cedar trees and in rocky fields and woods in partial shade. It is very variable, the sterile leaves being sometimes lanceolate, sometimes ovate. It fruits about the last week in May. The form called *Engelmanni* is the common one.

Botrychium Virginianum Sw. RATTLESNAKE FERN. The commonest of the genus growing luxuriantly in the mountains.

Botrychium ternatum obliquum Muhl. GRAPE FERN. This species does not appear to be common in Kentucky. I have found more plants in Barren county than elsewhere. Here it is called "sang sign," as the country people say "it pints towards a sang (ginseng) plant." It grows under beech trees. The form called *dissectum* is rare and the sterile fronds comparatively small.

OSMUNDACEAE.

Osmunda cinnamomea L. CINNAMON FERN. Common. Grows in profusion along the Green river and its tributaries in sandy soil.

Osmunda regalis L. ROYAL FERN. This species was once abundant in Edmonson county, especially near Chalybeate Springs, but it has been uprooted and carried away by the guests at the hotel until little of it remains. Another cause of its disappearance in certain localities is that the ubiquitous saw-mill and the agent for cross-ties have laid bare many of the haunts of this shade and moisture loving species. Where I once found fine fronds measuring four or five feet in length, I now find only stunted and dwarfed specimens.

SCHIZAEACEAE.

Lygodium palmatum Sw. CLIMBING FERN. Found only in Rockcastle and Laurel counties. Mr. Williamson mentions that it was reported from there from three different places in 1878. It was once abundant at Cumberland Falls, but so many collectors visit the latter place, where *Adiantum capillus-veneris* also grows, that it is to be feared both will be exterminated. It was once so plentiful there as to resemble tangles of dodder.

HYMENOPHYLLACEAE.

Trichomanes radicans Sw. FILMY FERN. Rare. Has been reported once or twice from Laurel county, and Prof. Hussey in his report mentions it from Edmonson county. I found it in 1892 along the Green river in Warren county. It covered a space of four or five square feet and was far under a sandstone cliff. The plants had many dead fronds and few fruiting ones. The trees were being cut away and its days in this spot are probably numbered. In 1900 I visited another station for it and here it had entirely disappeared.

POLYPODIACEAE.

Adiantum capillus-veneris L. VENUS' HAIR FERN. This species grows in profusion at Burnside, near Cumberland Falls. Fronds of this species were first received by W. M. Linney in 1880. He mentioned it to Williamson, who wrote an account of it in *Torrey Bulletin*.

Adiantum pedatum L. MAIDENHAIR FERN. Common throughout the State.

Asplenium angustifolium Michx. NARROW-LEAVED SPLEENWORT. Common in damp, rich woods. The most luxuriant plants I have found are in Barren county in a beech grove, and in Warren County in the depths of Wolf's sink, a 90-foot sink-hole or cave entrance near Sunnyside. The fronds measure five feet in length. Large forest trees grow from the bottom of the sink and the only means of descent is by a rude ladder made between two tree trunks. Legend says this is the original ladder used by the Indians.

Asplenium Bradleyi D. C. Eaton. Prof. Hussey, who first found this rare fern in Kentucky, thus describes the region in which it grows: "All the water courses in Edmonson county, even in the spring branches, take their rise between a series of steep cliffs. This water shed is intersected on either side by deep, high-walled ravines whence gush forth cool springs which either sink in the porous sandstone or plunge headlong into the rapid creeks that flow into Green river. Under these overhanging sand-rocks, sheltered from the sure and sweeping winds, are sometimes spaces of vast extent where the aborigines had their homes, as evinced by the numerous fragments of flint and by the mortar holes in the detached masses of sand-rock. On one of these sandstone cliffs, I find *A. Bradleyi*." In 1896 I visited this region for the express purpose of finding the fern, but though I searched a number of similar localities only found it on the same cliff. It had spread over the entire wall of rock and few plants grew low down. They were all fine, large plants. I hope no fern vandal will visit this station and exterminate it. It is 'far from the maddening crowd' and I reached it by stage, private carriage and farm wagon. The fern has also been found in Grayson and Warren counties.

Asplenium ebeneum Ait. EBONY SPLEENWORT. One of our commonest species. The negroes seem to coin names for plants,

as I have heard them call this the "rick-rack fyorn," in allusion to the outlines of the fertile fronds.

Asplenium ebenoides R. R. Scott. A few specimens of this have been found in Marion county, near Salt Lick creek, surrounded by ebony spleenwort and the walking fern.

Asplenium parvulum Mart. & Gal. LITTLE EBONY SPLEENWORT. This is not uncommon in Warren county, growing in limestone soil. My first specimens were found in a sink-hole in a fox's den. This species does not seem to have been mentioned in other lists of Kentucky ferns.

Asplenium pinnatifidum Nutt. PINNATIFID SPLEENWORT. Frequent, but extremely local in Southern Kentucky, growing only on sandstone cliffs. In one locality in Warren county there was an unusual form of this species, the lower pinnae being prolonged to a great length. Dr. Underwood, to whom I sent specimens, considered it quite unique and unusual. Unfortunately I had a visiting entomologist with me, whom the Society for the Preservation of Native Plants should convert, for she gathered all the peculiar fronds. Though I have visited this same spot several times since, I have never seen this form again.

Asplenium ruta-muraria L. WALL RUE. Rare. Found mostly in eastern Kentucky.

Asplenium montanum Willd. Common and widely distributed. I have found it on many sandstone cliffs of Edmonson county, though not abundant in Warren county. It seems to fork more frequently than any of our other ferns. I have found single plants with all the fronds forked two or three times.

Asplenium trichomanes L. MAIDENHAIR SPLEENWORT. Not uncommon throughout the State.

Athyrium thelypteroides Desv. SILVERY SPLEENWORT. Common throughout the State in rich, moist soil. It is especially fine in Muhlenburg county, near Rockport.

Athyrium filix-foemina Roth, LADY FERN. Common in sandy soil. Variable.

Camptosorus rhizophyllus Link. WALKING FERN. Common throughout the State, often completely carpeting the rocks. Locally known as "wall link."

Cheilanthes vestita Sw. Abundant in certain localities. Many of the limestone knobs are crowned with sandstone. On these cliffs, facing south or west, it grows often in company of *A. pinnatifidum* and *A. trichomanes*. Williamson mentions it as a rare fern in Kentucky, but there are many cliffs that are completely covered with it.

Cystopteris fragilis Bern. BRITTLE BLADDER FERN. One of the commonest ferns on limestone cliffs. It is especially abundant at cave entrances.

Cystopteris bulbifera Bern. Common, especially through the Green river section.

Dicksonia pilosiuscula Willd. Not uncommon.

Nephrodium Goldieanum Hook. Not common. I have found magnificent plants in Ohio and Muhlenburg counties.

Nephrodium marginale Michx. MARGINAL SHIELD FERN. Most abundant in shaded rocky woods.

Nephrodium noveboracense Desv. NEW YORK FERN. Plentiful.

Nephrodium thelypteris Desv. MARSH FERN. Fairly common in suitable situations.

Nephrodium spinulosum Desv. The most common fern in sandstone regions.

Onoclea sensibilis L. SENSITIVE FERN. Common. Commonly called Oak Fern.

Phegopteris hexagonoptera Fee. BROAD BEECH FERN. Widely distributed throughout the State.

Polypodium vulgare L. COMMON POLYPODY. Not very common, though found nearly throughout the State.

Polypodium incanum Sw. GRAY POLYPODY. More abundant than the preceding, growing upon limestone rocks as well as upon trees and sandstone cliffs.

Polystichum acrostichoides Schott. CHRISTMAS FERN. SWORD FERN. One of our most abundant species.

Pteris aquilina L. BRACKEN. Not common. I find it on rocky bluffs and in thickets in well-drained soil, usually in half shade. Williamson's assertion that it is always associated with the huckleberry is rather sweeping, as it grows on many Kentucky knobs where there is no laurel or other heath. Most sandstone hills, however, have two or three species of huckleberry on them, so the bracken is often found with them.

Pellaea atropurpurea Link. WINTER BRAKE. One of the commonest ferns of the State. It is common on all limestone knobs and is a well-known feature of cave entrances, growing in crevices where no other plant can gain a foothold.

Woodsia obtusa Torr. Common on limestone, especially along rivers. One of the earliest ferns to unroll, often appearing in February.

LYCOPODIACEAE.

Lycopodium lucidulum Michx. Common in suitable places. The form named *porophilum* is found on rocks in many places. First found in Warren county in 1892. I think this is the species Prof. Hussey identified as *L. selago* from Edmonson county. I have botanized extensively in this and adjoining counties and have never found *selago*.

Lycopodium complanatum L. Not uncommon in mountainous regions.

Lycopodium obscurum L. Not uncommon.

SELAGINELLACEAE.

Selaginella apus L. CREEPING SELAGINELLA. Plentiful in suitable places.

A Correction.

On page 24 of the January BULLETIN, in the key of *Equisetum variegatum* varieties, the sheaths of varieties *Jesupi* and *Alaskanum* are spoken of as *light*. The word should be *tight* in each case.—A. A. Eaton.

THE STAR FERN.

Hemionitis palmata.

BY WILLARD N. CLUTE.

For some time this journal has been promising the beginners a series of illustrated articles on curious or interesting exotic ferns, and as our plans are now matured, we have selected the star fern as the subject for the initial article.

When one has begun a collection of either living or pressed specimens of ferns, the star fern is usually one of the first exotics to find a place in it. Its hardiness, notwithstanding its tropical origin, enables it to thrive in greenhouse or conservatory life, while its abundance in many parts of the West Indies causes it to be represented in the collections of nearly every returned traveler. The remarkable shape of its fronds add greatly to its attractiveness in the eyes of those accustomed only to seeing ferns of the more usual shapes; indeed the skilled filicologist has to admit that this form is rare among ferns.

In its native lands, the star fern grows on half shady banks and prefers a moist situation, though it may often be found in full sun on slopes so dry that one wonders how it survives at all. During most of the year it may be exposed to an amount of insolation that no fern in the Northern United States, with the possible exception of the bracken, could withstand. In fact, the star fern would probably fare as ill as any other species in such locations were it not for its covering of close tawny hairs that prevents rapid evaporation from the leaf. When the heat becomes too intense, or when the ground is so dry as to no longer yield moisture, the fronds instead of dying, simply roll up and wait until it rains, when they unroll again ready to take up life anew.

This fern's method of fruiting is very characteristic. The veins in the frond anastomose at frequent intervals and the spore-cases are borne copiously along these veins throughout the frond, making it look as if it had been embroidered. This however, is not the plant's only method of reproduction. In the notches of the leaves little buds are formed, and as they grow

old and become prostrate these buds produce new plants. One may often collect specimens in which the old fronds each bear several plantlets.

The way in which the star fern fruits makes it a near relative of *Vittaria*, *Taenitis*, *Antrophyum* and *Meniscium*, all small tropical genera containing no species with common names. Not much farther removed are the genera *Notholaena* and *Gymnogramma*, in fact the plant called *Gymnogramma rufa* is thought by some to form a very good connecting link between the latter genus and the genus *Hemionitis*, to which the star fern belongs.

As fern students now regard *Hemionitis* it contains upward of half a dozen species, four of which belong to American tropics, the rest being found in the warmer parts of the Old World. The only other American species that is at all common is a pinnate plant, *H. pinnata*, which so closely resembles *Gymnogramma rufa* that it is hard to separate them. The star fern is found nearly throughout the West Indies and occurs on the mainland from Mexico to Peru. In Jamaica it is sometimes called strawberry fern, for what reason is not apparent. In no way does it resemble a strawberry.

SOME FERNS OF THE CAVE REGION OF STONE COUNTY, MISSOURI.

BY S. FRED PRINCE.

This country lies in the southern part of the Ozark Range, the greatest elevation being about 1,600 feet above sea level. The surface is cut up into long, crooked, steep-sided and much branched ridges, forming long narrow valleys and "draws," often bounded by precipitous cliffs, sometimes several hundred feet high. Whatever their height, these cliffs are usually hollowed in at the base, and below them is a steep slope covered with detritus from above. There are no lakes, and very few marshy places, and these of small extent and duration, being due mostly to overflow in spring. The country is so steep that the water drains off very rapidly, most of the streams being a succession of

tiny falls, as they leap from ledge to ledge in their descent. They are mostly shallow, too, except at flood times. The soil is formed principally from a decaying fossiliferous lime-rock, which, in various-sized fragments, covers the surface everywhere. The rocks exposed are almost entirely the limestone and magnesian of the Lower Silurian, some of which are zinc and lead bearing.

In some of the "draws," a long line of rocks seems to have split off from the main cliff and slid further down the slope, breaking up into irregular masses, varying from a few feet each way to those of a hundred feet or more in length, and of varying height and breadth. These masses are generally very much weathered and honeycombed, and afford foothold to many plants, and are great hunting grounds for ferns.

Some of these "draws" are so large as to accommodate a tiny farm of an acre wide at the broadest place, while others will have park-like expanses of fifty to sixty feet, but mostly the bottom of the gulch will not be over a few feet—the width of the bed of a brook, or of the torrent which pours down between the two slopes during the wet season. The valleys of the larger streams are also very narrow. Hundreds of springs trickle from the rocks, and drought seldom occurs. The whole country is heavily timbered, except at about 1,400 feet, where in many places occurs a line of open glades, many of which are constantly moist with oozing springs.

The winters are short and mild, and were it not for the oft-occurring forest fires, the country would be a veritable fern-paradise. These fires undoubtedly account for the rare occurrence of those species which prefer to grow in the ground. It will be noticed that the species mentioned in my list either occur in places safe from fire, or they are species whose rhizomes lie so deep as to be beyond injury, as in the case of *Pteris aquilina* and *Botrychium*, though even these are rare.

My notes deal more especially with the vicinity of Marble Cave. This cavern is very large, and in common with most

of the caves of this section, has its entrance from above. At the bottom of a large "sink" is an opening of about twenty feet wide by an hundred long, with perpendicular walls of rock which drop thirty to seventy feet, beneath which lies a large chamber 200 by 400 feet and 200 feet deep. The great uniformity of temperature (about 60 deg.) and moisture in this sunken glen, make the conditions perfect and these cliffs are densely covered with mosses and ferns, some of which attain a wonderful development, and all are practically "evergreen." Here I have found *Aspidium acrostichoides*, *Asplenium ebeneum*, *A. ebeneum incisum*, *A. parvulum*, *A. trichomanes*, *Camptosorus rhizophyllus*, *Cystopteris bulbifera*, *C. fragilis*, *Pellaea atropurpurea*, and *Woodsia obtusa*. In all cave openings *Pellaea atropurpurea* and *Camptosorus* are apt to be found, and often one or several of the others. Sometimes the *Woodsia* and *Cystopteris bulbifera* will be found far back in the dim light, but there is a temperature line which fern life seems to be unable to cross, 49 degrees. *Woodsia* and *Cystopteris* are commonly found together; *Camptosorus* is cosmopolitan.

A number of ferns are as truly evergreen here as the Christmas fern. In cave entrances where moisture and temperature vary little during the year, many ferns keep up a continuous growth, and specimens from prothallia to mature frond may be obtained at any time. But even under more ordinary conditions a number of species can be found with like habits. Except in the driest, most exposed places *Pellaea atropurpurea* carries its fronds over until the next year's growth is mature, and in moist, protected places can often be found in all stages of growth at any time. The ebony and little ebony spleenworts, and maidenhair spleenwort, are evergreen like the Christmas fern.

The maidenhair, rattlesnake fern, bladder ferns, *Onoclea*, oak fern, the bracken and woodsia, lose their foliage in winter, and send up new fronds in spring. Otherwise our ferns seem to take a short rest during the hot, dry mid-summer season, and

keep up a continuous growth during the rest of the year. They do not die down like *Cystopteris*, but the foliage is changed gradually.

LIST OF FERNS FOUND.

Adiantum pedatum L. AMERICAN MAIDENHAIR. A rare fern here. On the margin of springs in thin but rich soil, or oftener in the water in dense tangled masses. Sparingly fruitful. Have not found it below 1,200 feet.

Polystichum acrostichoides Swz. CHRISTMAS FERN. Also rare in this locality, growing on moist, shady hillsides, and not very large.

Polystichum acrostichoides var. *incisum* Gray. The most common fern of the whole Ozark region, growing nearly everywhere, under the most varying conditions, but in shady, damp mossy hollows in greatest luxuriance, and of large size. The lower pinnae are often nearly again pinnate, and sori are borne in numbers to the middle of frond, the fertile pinnae often little or not at all modified. It is truly evergreen here.

Asplenium ebeneum Ait. EBONY SPLEENWORT. Common; among mossy stones on shaded hillsides, near springs, sometimes on moist cliffs.

Asplenium ebeneum var. *incisum* Moore. Occurs more frequently, and in the same locations as the type—often with it.

Asplenium parvulum Mart. & Gale. LITTLE EBONY SPLEENWORT. Not at all rare, nor very small, often reaching two feet in length. On mossy rocks, or shaded, moist cliffs.

Asplenium trichomanes L. MAIDENHAIR SPLEENWORT. Not rare; very large and handsome. On mossy rocks in moist, shaded places.

Asplenium ruta-muraria L. WALL RUE. Very rare. I found one group of plants on a ledge just within the entrance of a limestone cave, where the rocks were constantly moist, and the sun never penetrated.

Botrychium Virginianum Swz. RATTLESNAKE FERN. Somewhat rare, and scattered; in rich, shady woods.

Camptosorus rhizophyllus Link. WALKING FERN. Very common, on rocks wherever there is moss enough for foothold, and protection from fire; more luxuriantly where there is constant moisture and shade. In dry time it crumples up and seems to die, but after rain it unfolds its fronds and continues its growth.

Cheilanthes lanuginosa Nutt. WOOLLY LIP FERN. Common on southern faces of exposed cliffs; rolls up its fronds in dry weather, but when moister conditions prevail, unrolls them as fresh as ever.

Cystopteris bulbifera Bernh. BULBOUS BLADDER FERN. Very common; forming long lines of green in clefts between soft limestone strata; sometimes on the ground beneath, among the stones.

Cystopteris fragilis Bernh. COMMON BLADDER FERN. Rare; moist shaded rocks.

Notholaena dealbata Kunze. WHITENED NOTHOLAENA. Somewhat rare; mostly in inaccessible places on southern faces of exposed cliffs.

Onoclea sensibilis L. SENSITIVE FERN; LEADWORT. Very rare. I have only found it twice, growing in the water flowing from a small spring, its roots fastened in the crevices of the rock, and without a trace of soil.

Onoclea sensibilis var. *obtusilolata* Torrey. Very rare. Growing on the flat rock bottom of a shallow brook, the sori well developed and quite numerous on the fertile frond.

Pellaea atropurpurea Link. PURPLE CLIFF BRAKE. One of our most common ferns, growing in clefts and crevices of cliffs and rocks, everywhere; sometimes on very small rocks, and occasionally on the ground. It is extremely variable, its pinnales softer, greener and broader in moist, shaded situations.

Phegopteris hexagonoptera Fee. BEECH FERN. Rare; wet hollows in shady woods; not below 1,500 feet.

Pteris aquilina L. BRACKEN; EAGLE FERN. Not common; short, crisp, and sturdy; in dense masses on sunny hillsides.

Pteris aquilina var. *pseudocaudata* Clute. Not common; three to four feet long; fronds thin, tender, green—in maturity becoming harder.

Woodsia obtusa Torrey. OBTUSE-LEAVED WOODSIA. Common; moist or dripping rocks.

THE CALIFORNIA GOLD FERN.

BY A. A. EATON.

The genus *Gymnogramme* is rather large, containing ninety or one hundred species, almost exclusively tropical, one species extending to Europe, three or four to Japan, two to the United States, and two on the other side of the equator to the temperate climate of New Zealand. It received its name from the Greek, *gymnos* naked, and *gramma* a line, in reference to the fact that the fruitage is destitute of indusium and follows the veins. The fruit lines are often at first covered with scales or wax.

The goldback belongs to the division *Ceropteris*, the "waxy ferns," and to this belong many of the "gold" and "silver" ferns of the greenhouses. The color is due to little colored globules of wax, easily detached, and indeed not appearing to be attached to the frond at all. This wax is removed by shaking or sprinkling, is soluble in alcohol and may be melted in hot water. The color is not characteristic for the species, for nearly if not all the species of waxy ferns have their "gold" and "silver" phases.

No fern growing in the United States is calculated to give more pleasure to the enthusiastic collector at first sight than the gold fern. Others there are that are more graceful, others yet more majestic, and still others more rare, but to a person who has traveled on the thirsty plains, where hardly a green thing greets the eye, has toiled with lagging steps up the steep mountain trail, and begins to feel that about the only things Califor-

nia can boast of are dust and distance, a cluster of gold ferns beside the trail are enough to make him conclude that there *are* things in California that more than offset the unsightly.

This should have been the State emblem rather than the poppy, which conveys no special idea save ubiquity. California, the State of romance, the land of paradoxes, of smiling vineyards and burning deserts, gigantic forests and treeless plains, of Pactolean streams which in one part wash the gold in the sluice of the miner and in another water the orchards of fig and orange of the husbandman, has here a graceful plant which only seems to thrive where its roots below embrace the wealth to which its ornament is an index; which seems to possess the gift of Midas and use it for its own ornamentation. The land of gold should have an emblem of gold.

As found by me in Fresno county, the plant is confined to an altitude of two thousand to four thousand feet, appearing as soon as chaparral thickets are met and disappearing just below the timberline is reached. It is practically confined to the Pacific coast of the United States, though said to reappear in Ecuador. It grows in the peculiar disintegrated granite rock, so often the source of gold. It seldom is found in crevices with little soil, and almost never in the shade. It loves the open sun, the free mountain breezes and an undisputed domain. Its root-stocks are creeping, but short, thickly covered with the remains of dead stipes mixed with brown scales, and bearing at the tip a cluster of ten to twenty fronds. These appear about the first of March and chiefly develop after the rains have ceased: for rains rob them of their riches. As found by me, the fronds are mostly two and one-half inches each way, but further south they are larger. At first the fruit is not seen; but in May it ruptures the waxy covering and completely covers the back of the frond. After this, most of the fronds roll and seem to wither in the intense heat and drought, and the old ones die. The fronds of the year, however, regain their wonted appearance at the first rains of autumn.

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A NEW FORM OF THE CHRISTMAS FERN.

BY WILLIARD N. CLUTE.

At the recent meeting of fern students near Forestville, Conn., Mrs. C. S. Phelps, of Salisbury, Conn., exhibited a most curious and interesting variety of the Christmas fern which she subsequently asked me to describe. In this form the tip of each pinna for about one-third of its length is folded backward along the line of the midrib and grown together and the entire tip is then curved over toward the rachis on the upper side of the frond. Looking at the frond from the upper surface, each pinule presents a loop-like extremity that gives it a most characteristic appearance as if it were just unrolling. At first glance this form appeared to be simply a freak, but Mrs. Phelps assured us she had found it in two places in Salisbury and later I had the good fortune to discover another plant of the same form in a piece of woods near Forestville, Conn., some fifty miles or more from the previously known stations. The plant thus seems not only widely distributed but fairly common and no doubt other fern collectors will later report it. While it differs from the normal Christmas fern in unimportant characters, and cannot be considered a species or sub-species, we believe it should have a name and therefore describe it as follows:

POLYSTICHUM ACROSTICHOIDES forma RECURVATUM. Root-stock and frond as in the type with the exception that the edges of the pinnae are reflexed and grown together along the line of the midrib for about one-third their length, beginning at the tip; tips of the pinnae recurved toward the upper surface of the frond for about half their length. Type from Salisbury, Conn., and now in the author's herbarium, collected by Mrs. C. S. Phelps. Some of these specimens were in fruit and an effort will be made to raise other plants from the spores.

IS ASPLENIUM LANCEUM AMERICAN?

About eight years ago I bought from Reasoner Brothers, Oneco, Fla., some plants listed as *Polypodium Swartzii* from Key Largo. On receipt I found them to be *Asplenium lanceum*,

and wrote to Mr. E. N. Reasoner for proof as to their origin, telling him of their identity. He replied that, of course, he could not swear they came from Key Largo, but supposed they did, as they had received a climbing fern from there. I was surprised later in looking over a friend's collection that Mr. Reasoner, after dropping it from his catalogue for several years, was still selling the same thing for *P. Swartzii*. It was on some plants from the same lot that Mr. Ferriss based his remarks at St. Louis. In November, 1903, I saw Reasoner's collector in Key Largo. He hardly knew what a fern was, and had never seen one answering to the description. In May, 1904, I had the pleasure of meeting Mr. Reasoner, who gave me the probable history of the error.

Mr. Pliny Reasoner, on a trip to Key Largo, collected *Polypodium Swartzii* and sent it home. This eventually died and the label in some way got transferred to the *Asplenium*. At the time I wrote Mr. Reasoner as to the identity of the plant he had, as he thought, sold it all out. A few years later enough had developed to again list. He had by this time forgotten about my letter and again listed it as *P. Swartzii*. This, it appears to me, proves satisfactorily that the record of its being naturalized on Key Largo is based on an error.—*A. A. Eaton, The Ames Botanical Laboratory, N. Easton, Mass.*

SOME RARE FERNS OF CENTRAL NEW JERSEY.

BY HOMER D. HOUSE.

The fact that many of our Eastern ferns which we consider scarce are here and there locally abundant, needs no argument in its support. Nearly all sections of the country have a greater or lesser number of the "local plants" and Central New Jersey is no exception to this. The sandy, "pine-barren" region extends northward to within three or four miles of New Brunswick and ends there very abruptly. For ten miles north of here the soil is chiefly red shale or rich loam. North of Bound Brook and Plainfield begins the trap-rock hills of the Orange mountains.

The climbing-fern (*Lygodium palmatum*) is regarded as one of the rarest of our ferns. Its rarity is also combined with a tendency to grow only in very local and secluded spots. There are several swamps in Middlesex county in which *Lygodium* exceeds, in quantity, all of the other ferns found there combined. The finding of it in such abundance was a great surprise to me for two reasons; first, I had come to regard it as a fern nearly exterminated, and secondly, the localities are chiefly within thirty-five to forty miles of New York and often visited by botanists. Here, at least, the fern is not becoming exterminated and is also well protected by the dense thickets of catbrier which render the swamps almost impassable. The basal leaves of *Lygodium* are evergreen and are very conspicuous in the winter and early spring before obscured by a mass of other vegetation.

The chain-fern (*Woodwardia areolata*) is frequent in the more exposed and wet places of the same swamps in which is found *Lygodium*. In the moist, open places of the pine-barren region two species of *Lycopodium* probably reach their northern range near Milltown, in Middlesex county. *L. alopecuroides* is found in several places and *L. Carolinianum* occurs in but one locality near Milltown.

On the trap-rock hills north of Plainfield and Bound Brook, in Middlesex county, is found *Cheilanthes lanosa*. From all accounts this range of hills is not far from being the northern range of this fern in New Jersey. Along the rocky sides of a narrow valley near Bound Brook this fern, which is often considered rare, is quite abundant. *Woodsia obtusa* is common throughout the rocky hills of this region, while the walking-fern (*Camptosorus rhizophyllus*), which is so abundant in the limestone region of New York and New England, is very rare here, a few plants only being found on the trap-rock. *Asplenium platyneuron*, which also has a preference for limestone soil, is not rare here. I was unable to find any specimens of *Asplenium trichomanes*, though it has been collected in this region and

must be regarded as a rarity here. All told, there are about forty-five species of ferns in Central New Jersey.

ADDITIONS TO THE CALIFORNIA FERN FLORA.

BY S. B. PARISH.

Perhaps the most useful purpose served by plant lists, such as the series of State fern-floras, now in course of publication in the FERN BULLETIN, is that they supply a basis for additions and corrections, and thus a fuller and more accurate knowledge of the plant inhabitants of a region is eventually secured. But the lists themselves are hardly published before they need revision. My own recent list of the California ferns already requires some additions, which are of sufficient importance for record.

Botrychium Coulteri Underw. Mr. Gilbert informs me that he has a specimen of this plant, collected in August, 1883, by Mrs. C. C. Bruce, in King's Valley, at the base of Lassen Butte, in the extreme northeastern corner of the State. The flanks of Lassen abound with hot springs, many of them boisterous and charged with mineral, so that the plant finds here an environment quite like that of the Yellowstone, where it was first collected.

Cheilanthes myriophylla Desv. Very good specimens of this fern were collected by Mr. A. A. Heller, July, 1902, near the summit of Mt. Sanhedrin, in Lake county.

Asplenium septentrionale Hoffm. This fern has been collected by Mr. T. S. Brandegee on San Pedro Martir Mt., in the northern part of the peninsula of Lower California, where he reports it as growing in abundance. It may be expected, therefore, at some of the higher altitudes of the southern Sierra. By reason of its diminutive size, and peculiar aspect, it might easily escape detection, and collectors should be on the outlook for it.

Polystichum Lemmoni Underw. Mr. C. F. Baker's last distribution includes specimens of this rare fern from Mt. Eddy, in

Siskiyou county, where it was collected in August, 1893, by Dr. E. B. Copeland. Mt. Eddy is a neighbor of Mt. Shasta, the station already known.

Pilularia Americana Al. Br. The same distribution contains specimens of this plant, from a third station, Ramona, San Diego county, collected by Mr. Brandegee, May, 1902. They grew in pools, on a clay mesa.

RAISING PROTHALLIA OF BOTRYCHUM AND LYCOPodium.

BY WILLARD N. CLUTE.

The prothallia of most species of *Botrychium* and *Lycopodium* are so rare that the finding of any of them is regarded as a noteworthy occurrence. Indeed, the prothallia of many species are absolutely unknown, for although the spores germinate, it has thus far been impossible to bring the prothallia to maturity. In the specimens that have been accidentally discovered the outer cells are always infected with a fungus and it appears nearly certain that a sort of symbiotic relationship has been struck up between prothallus and fungus which makes them mutually dependent. If this be the case, then it would seem only necessary to inoculate the germinating spores with cultures of the fungus to get a fine crop of prothallia. This theory, which does not appear to have been advanced before, is very easily tested and it is hoped some reader of this magazine may make the trial.

A somewhat similar state of affairs has been found to exist among the orchids. Seedling orchids have always been notoriously hard to bring to maturity. The seeds will germinate readily, but the young plants are prone to die when still seedlings. Recently this has been changed by the discovery that the seedlings will thrive if grown in soil in which old plants of the same species have been growing, because they thus are able to come in contact with a fungus necessary to their existence.

One who undertakes to raise prothallia of *Botrychium* or *Lycopodium*, is advised to procure soil from the immediate vicinity of the growing species he wishes to rear. Upon this

soil, or mixed with it, since the prothallia are subterranean, the spores should be sown, and then treated as the spores are in raising ferns—with one important exception: the watering should be done with water in which the roots and other underground parts of the species have been soaked. By this means it is likely that the fungus would reach the young prothallia. It would be well to make two or three sowings of spores in different pans and water some as outlined above while others are watered with water in which soil from close to the roots of the plant has been soaking. In nature, new plants are constantly springing up from spores and it is preposterous to think that man cannot do as well or even better. We shall simply have to experiment until we find the right way. Then the matter will be easy enough.

THE FOURTH MEETING OF FERN STUDENTS.

The fourth meeting of fern students under the auspices of the Linnaean Fern Chapter, was held in connection with the Nature Study School at the Connecticut State Chautauqua near Forestville, Conn., July 19, 1904. Owing to the fact that it was not decided to hold this meeting until too late to give adequate notice to those interested in ferns, the attendance was smaller than it otherwise would have been, though the audience was larger than that at the meeting last December in St. Louis. Five States were represented by members present.

The formal part of the meeting began at 1:30 p. m. with the election of Mr. C. H. Bissell, of Southington, Conn., as chairman, and Mr. Amedee Hans, of Stamford, Conn., as secretary. Dr. E. F. Bigelow, director of the Nature Study School, delivered the address of welcome, to which a response was made in behalf of the Chapter by Chairman Bissell. Mr. A. Vincent Osmun, of Amherst, Mass., was the first speaker. He showed a number of fronds of *Dicksonia pilosiuscula* f. *schizophylla* and reported that the plants, though sterile, are increasing in number by means of underground stolons. Mrs. Elizabeth B. Davenport, of Brattleboro, Vt., spoke upon a dissected form of *Osmunda cinnamomea* in which the pinnules were pinnatifid. Other speci-

mens were brought to the meeting by Mrs. C. S. Phelps, or Salisbury, Conn., in which the pinnules nearest the rachis are much enlarged and nearly pinnate. Willard N. Clute next spoke of the new form of Christmas fern and mentioned that it would be called forma *recurvatum*. Mr. A. A. Eaton was unable to attend the meeting owing to an unexpected trip to Maine. He sent a paper on his experiences with the Florida ferns which was read by Willard N. Clute, who added various notes from his own observations on these species in the West Indies. Mr. Bissell followed with a fine series of specimens of rare Connecticut ferns, mentioning the localities in which they grew, and discussing the possibility of their being found elsewhere in the State. This feature was of great interest, especially to all the Connecticut members present. Mrs. Davenport also exhibited a number of most excellent fern photographs which, we understand, are to be increased until all the ferns of Vermont are represented. After the presentation of papers, the rest of the day was spent by the members in comparing notes and getting acquainted with one another. No doubt as the advantages of these meetings become better known the attendance will increase until all fern students within reach of the meeting will be present. It would be excellent if a meeting of this kind could be held annually.—W. N. C.

CONCERNING FORMS AND HYBRIDS.

BY WILLARD N. CLUTE.

In *Rhodora* for April, 1904, there is described a fern from Vermont which is regarded as a hybrid between *Nephrodium spinulosum* and *N. Marginale* and named *Dryopteris Pittsfordensis*. With the exception of the lady fern, *Athyrium filix-foemina*, North America does not contain a more variable species of fern than *Nephrodium spinulosum*. As has been shown in THE FERN BULLETIN, the characters depended upon for separating such marked forms as typical *N. spinulosum dilatatum* and *N. s. intermedium* do not hold and it appears to me sheer nonsense to make so much of a variant form. I am more moved to make these remarks by the fact that the describers, although believing it to

be a hybrid, have given it a name that by right belongs only to a distinct species. If distinct enough from *N. spinulosum* to be considered a separate form—which does not seem to be the case judging from the drawings—it should undoubtedly be called *Nephrodium spinulosum x marginale*. If this form is entitled to a binomial, what rank can we possibly give to *Nephrodium spinulosum var intermedium*? In no other branch of botany, so far as I am aware, has it been considered proper to give hybrids a binomial, and the sooner fern students cease the practice the better. Indeed, it may be questioned whether *Asplenium ebenoides*, now that it is known to be a hybrid, should not be written *Asplenium ebenicum x Camptosorus rhizophyllus*.

The mania for making new species that has at last got New England under its spell is likely to result in a large number of new combinations. *Nephrodium Pittsfordense* and *N. Concordianum* are very apparently not distinct species in the sense that *N. Marginale*, *N. goldieana* and *N. filix-mas* are, but belong to the category that includes the famous Boston fern "*Nephrolepis Bostonensis*" which certain people still regard as a species separate from the plant of which it is a form. If there are any other towns in New England that desire a fern named for them, any woodland in which *Nephrodium spinulosum* grows will furnish the necessary form.

CURRENT LITERATURE RELATING TO EUROPEAN FERNS.

CONTRIBUTED BY AUG. H. HAHNE.

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PANTU, F. C. *Ophioglossum vulgatum la gioragarla langa Bucuresci*. Publ. soc. nat. din Romania. 1902.

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SAGORSKI, E. *Ueber Aspidium rigidum und A. pallidum*. Oesterreichs botan. Zeitschr. Vol. 53, Nr. 1.

SCHMIDT, J. *Die Pteridophyten Holsteins in ihren Formen und Missbildungen*. Hamburg, 1903.

Mr. G. E. Davenport has described another form of *Nephrodium spinulosum* in *Rhodora* for February. It was found in Concord, Massachusetts, and has been named *Concordianum*. It is described as a large plant with tripinnate fronds, whose segments are distinct, narrowly angular and aculeate. Mr. Davenport regards it as having arisen as a "spore variation."

ISOETES AMESII: A CORRECTION.

Through failure to see proof of Gilbert's list of ferns and allies of New York in the October BULLETIN, there has arisen an unfortunate confusion of names. This species is given as a straight synonym of *I. riparia Canadensis* Eng. (now *I. Canadensis* (Eng.) A. A. E.). It should have read "*I. Canadensis* in part," it being segregated from Engelmann's specimens at first referred to that species. Subsequent study proved *Amesii* not to be safely separable from the polymorphic *I. saccharata*, and in *Rhodora* for November, 1903, I described it as *I. saccharata* var. *Amesii*. This description appeared before the October BULLETIN and would be the correct name by priority.—A. A. Eaton, Ames Laboratory, N. Easton, Mass.

EQUISETUM VARIEGATUM IN CONNECTICUT.

In the BULLETIN (Vol. XI, No. 2), in an article on "*Equisetum scirpoides* in Connecticut," I made the statement that *E. variegatum* had been reported from that State, but that probably *Scirpoides* had been mistaken for it. I have since received a specimen of *variegatum* from Mr. C. H. Bissell, which he collected on the banks of the Housatonic river at Cornwall, Conn. Mr. Bissell informs me that this species also has been collected at Canaan, and he thinks it probable that it will be found in other places along the Housatonic.—A. Vincent Osmun, Amherst, Mass.

INDEX TO CURRENT LITERATURE RELATING TO FERNS.

Readers are requested to call our attention to any omissions from this list.

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- SLOSSON, M. *A New Hybrid Fern from Vermont*. Rhodora, Ap. 1904.
- UNDERWOOD, L. M. *Ceropteris triangularis in Alaska*. Fern Bulletin, Ap. 1904.
- UNDERWOOD, L. M. *The Early Writers on Ferns and their collections*.—H. Torrey, Ap. 1904.

NOTES.

A copy of the index to Volume XI is mailed to subscribers with this issue.

In Mr. Prince's article on the ferns of the cave region in Missouri he speaks of the sensitive fern as leadwort. It would be interesting to know how this name has come to be applied to the plant.

We regret to announce the death of Mrs. E. C. Anthony, which occurred at Gouverneur, N. Y., on March 17th last. Mrs. Anthony was well known to fern students, having been an industrious collector of ferns and at the time of her death had an excellent and extensive herbarium. Several articles on ferns from her pen have been published in this journal.

Dr. E. F. Bigelow tells us that the bushy rootstocks of the *Osmundas* ploughed up in pastures and meadows, are called "skunk's tails" by country lads. These rootstocks last a long time after the plants have died and have a fairly striking resemblance to the tails of the animals mentioned.

In many parts of Connecticut, and perhaps elsewhere, the Christmas fern is called "hardy fern" in allusion, doubtless, to its evergreen fronds. The gardener, however, would call any fern able to survive the winter a hardy fern. The sturdy Christmas fern well deserves the title, though the common polypody might dispute its right to the title.

Mr. C. F. Baker, whose collecting trips to unknown regions has resulted in the discovery of many new species, has been appointed Botanist to the Cuban Government and his address is now Estacion Agronomica Santiago de las Vegas, Habana. Mr. Percy Wilson, formerly of the New York Botanical Garden, will act as his assistant.

At the St. Louis meeting of the American Association for the Advancement of Science, Prof. Stanley M. Coulter, in illustrating a paper on the ecological relations of some swamp areas, showed some views in Eastern Iowa, in which the tree trunks were covered with *Polypodium incanum*. This plant, with the *Woodsia Ilvensis*, reported by Prof. Shimek, adds two species to the fern flora of Iowa as recently published in this journal.

After much delay, a complete set of the FERN BULLETIN has at last been secured and now reposes in the Boston Public Library. Complete sets are quite rare and we know of but two others in public institutions, one being at Columbia University and the other at the Michigan Agricultural College. No doubt there are several others and it would be of interest not only to us but to those desiring to consult the early issues, if the whereabouts of complete sets was put on record. We would also like to hear from subscribers owning complete files. The early numbers are becoming so scarce that it is a distinction to have a full set. Let us hear from you. A postal card will do.

EDITORIAL.

The editor has been away from home during the past school year and matters not requiring his special attention have been attended to at Binghamton, as usual. If any subscriber, however, has failed to receive the numbers as issued, or any contributor has failed to receive extra numbers containing his article the editor invites them to inform him of the fact in order that matters may be set right. We do not look upon the publication of this journal as a matter of mere dollars and cents. The editor is personally acquainted with perhaps a third of the entire list of subscribers and feels that he knows many of the other through correspondence; therefore he has a certain interest in their having full files of the magazine and being otherwise satisfied. If your magazine fails to reach you, let us know. We are glad to replace free any copies lost in the mails.

* *

There is no use denying the fact: the output of technical matter relating to North American ferns is decreasing. Ten or fifteen years ago, the ferns were considered to be fairly well known and not until the advent of the Fern Chapter and the FERN BULLETIN with their facilities for stimulating the study of ferns, was this branch of botany much in evidence. That the impetus thus given the study was of no small consequence may be inferred from the fact that before the appearance of the FERN BULLETIN there was not a single popular manual on ferns in America and now there are no less than eight volumes that cover the ground more or less satisfactorily, while the number of new species, varieties and forms that have been since discovered and described has been most astonishing.

* *

With the issuing of these books the fern-loving and fern-studying public has been greatly increased and as a result our ferns are probably as well known as those of Europe. The range of nearly all can be defined with exactness, their time of fruiting is well known and their habitats so familiar that a good fern-

student can say with considerable certainty what ferns will be found in a given locality when still some distance from it.

* *

We thus find ourselves at the beginning of another period in the study of ferns. Our principal forms are well known; to what shall we now turn our attention? Shall it be the cultivation of ferns and the hybridizing of species, or shall we follow European precedents and give more attention to variant and abnormal forms? As we have said, the amount of technical matter is decreasing, and we have some doubts in selecting matter for this magazine, whether it is best to use articles bearing on fern culture or to use material of a more general nature to supply the deficiency. We would be glad if our subscribers would indicate their desires in this matter.

* *

It has seemed to us that American fern students are familiar enough with our ferns to welcome information about exotic ferns, especially those from the American tropics. In subsequent numbers we shall endeavor to pay more attention to this phase of the subject. It is not intended, however, to overlook the ferns nearer home and articles and shorter notes upon our ferns will be gladly received.

* *

Mr. Aug. H. Hahne, of Bonn, Germany, has kindly undertaken to supply us with an index to the current literature of Europe relating to ferns. The first installment appears in this issue. Americans as well as Europeans will doubtless be interested in it. Any corrections or additions to the index may be sent to Mr. Hahne or to this office.

In publishing upon a collection of ferns from Southern Brazil in *Hedwigia*, Dr. E. Rosenstock describes a new species of *Nephrodium* as *N. pseudothelypteris*. It grows in situations similar to our well known marsh fern. It is interesting to note that *Osmunda cinnamomea* is also found in that far away region.

BOOK NEWS.

"The Fern Allies of North America" is the title of a volume by Willard N. Clute that is expected to appear early in 1905. It will be a companion volume to "Our Ferns in their Haunts."

Notwithstanding the fact that the end of the average scientific journal follows pretty closely upon the beginning, new publications continue to spring into existence. Among the more recent ones, *The Amateur Naturalist*, Binghamton, N. Y., bids fair to outlast its contemporaries by reason of the fact that its editor and owner has been engaged for many years in the printing business, owns his own office and therefore is not so dependent upon a large subscription list as some others. The contents of the first numbers, however, indicate that a large subscription list is likely to be his also.

The second part of Grout's *Mosses** continues that excellent work from the Dicranaceae through the Tortulaceae. Too much cannot be said in praise of the clear and accurate plates reprinted from various sources, twenty-four of which are found in the present issue, together with numerous other cuts in the text. The text is both lucid and accurate and the keys most helpful. Undoubtedly this is the best book for moss students to be found in America.

"The Garden Diary"† is a little book in which there is a page for each day in the year, headed with some appropriate quotation from the British poets, together with notes on the progress of the seasons in England. Enough space is left for various notes by the owner. It is issued for British readers, but will be found interesting and useful by readers on this side of the world.

An unique and valuable contribution to tree literature is J. Horace McFarland's "Getting Acquainted With the Trees."** It is not another "popular manual" but a collection of essays on trees

**Mosses with Hand-Lens and Microscope*, Part II. By A. J. Grout. New York: Published by the author. 1904. 8 vo., paper, \$1.00.

†*The Garden Diary*. By Rose Kingsley. New York: James Pott & Co. 1904. 16 mo., 75c net.

***Getting Acquainted with the Trees*. By J. Horace McFarland. New York: The Outlook Co. 1904. 8 vo., 240 pp., \$2.50 net.

from the esthetic point of view illustrated by upward of one hundred of the photographs of trees, leaves, flowers and fruits for which the author is famous. The volume is not only in the best style of the bookmaker's art, but is made from a special kind of paper designed expressly for the reproduction of photographs. But not alone for its artistic make-up is the volume to be commended. The author has the faculty of seeing new beauties even in common things and has presented us with a new and original text upon our native trees.

"Bog-trotting for Orchids"†† is not, as the name would seem to indicate, a mere account of wading expeditions in swamps and bogs in search of orchids. The author has pretty thoroughly explored the Hoosac Valley and the region about New York city and while orchids were the main inspiration she has not been unmindful of the birds and other flowers and has much to say of them in her book. The bog-trotting expeditions extended over three seasons and appear to be given in sequence. We are of the opinion that had these experiences been woven into a composite narrative the book would have gained in interest. The localities in which these orchids grow are described rather too closely for the comfort of those who have been keeping the secret of their whereabouts, though it will probably delight beginners looking for these rarities. Nearly fifty plates from photographs, most of them colored, add interest and embellishment to the volume. The book is well worth reading by all botanizers, though many will find the author's christening of a hybrid plant with a new specific name "per letter," puzzling to say the least.

Although the author of "New England Ferns and their Common Allies"*** has had the advice of a prominent New England fern student the book shows the novice hand in many respects. Even the title is unfortunate, since there is an earlier volume by Dodge called "The Ferns and Fern Allies of New England." An undue predilection for the common names is shown in the

††Bog-trotting for Orchids. By Grace G. Niles. New York: G. P. Putnam's Sons. 1904. 12 mo., 300 pp., \$2.50 net.

***New England Ferns and their Common Allies. By Helen Eastman. Boston: Houghton, Mifflin & Co. 1904. 12 mo., 155 pp., \$1.25 net.

use of such absurdities as "Purdie's Concord Nephrodium" and in listing the ferns under their common names. If the book succeeds in its purpose it may be supposed that its readers may later be stimulated to study more about their plants in other volumes, but since no author citations are given this will be no easy matter. The keys to the genera of ferns are both clear and understandable to the scientist, though not arranged on modern lines, and it is doubtful whether the beginner will be able to handle them. There are no keys to the species, and the range is seldom given, even in the case of rare species. We find it difficult to agree with the author that "much confusion is apt to arise from laying too much stress upon the indusium as a means of identification" or that other points such as texture and cutting of the frond are "more stable." Young students will doubtless regret that more space has not been given to the varieties mentioned, since these are most difficult to identify. This much in criticism of the book. In its favor may be mentioned that it is well printed and compact enough to be taken into the field and that it is the very first American volume to consider the fern allies in a popular way. There are upward of fifty illustrations from photographs showing fronds or pinnae of nearly all the species mentioned in the book, which should be very helpful to beginners. One excellent feature, found in no other fern book, is the italicising of the distinguishing characters, by which means the novice is helped materially in identifying closely resembling species. No doubt it will add many recruits to the rapidly increasing company of fern students.

FERN CHAPTER NOTES.

Members not in arrears for their dues may obtain free of charge for the asking, the following ferns: *Lygodium palmatum* from New Jersey; *Scolopendrium vulgare* from Perryville, Chittenango Falls and Jamesville, N. Y., and *Dryopteris simulata* from Sylvan Beach, Oneida Lake, N. Y. Address the Secretary.

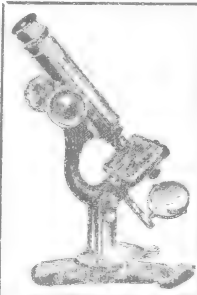
Members are asked to send the names and addresses of persons interested in Botany, and especially in ferns, to the Secretary, who will try to interest them in the Chapter by means of circulars.

TO BEGINNING STUDENTS

Many who take up recent issues of THE FERN BULLETIN find them too technical for easy reading; but it should be remembered that the magazine has grown technical as it advanced in years. The early issues are much less technical, though none the less accurate, and the articles, written mainly by beginners, deal with topics chiefly of interest to beginners. One should not overlook the series of "Helps for Beginners" in which a large number of our ferns are illustrated and described; the series on *Equisetums*, in which every species in North America and all the varieties are described; the eighteen portraits of fern students, including portraits of D. C. Eaton, G. E. Davenport, L. M. Underwood, B. D. Gilbert and the authors of all American books on ferns. At 25 cents each, these portraits would amount to more than we ask for a set of the magazine. Since the journal was established great additions have been made to our knowledge of ferns, and these back numbers contain an immense amount of information regarding extensions of range and fern habits that can be found nowhere else. A large number of new species and forms are also described. The series of Fern-floras recently begun are of themselves worth the price of subscription. Inquire of any old fern student and you are pretty certain to find he has a file of the FERN BULLETIN as complete as he can get it. The first five volumes are now out of print. Volume 6 is nearly so. Order in time. Note the following prices:

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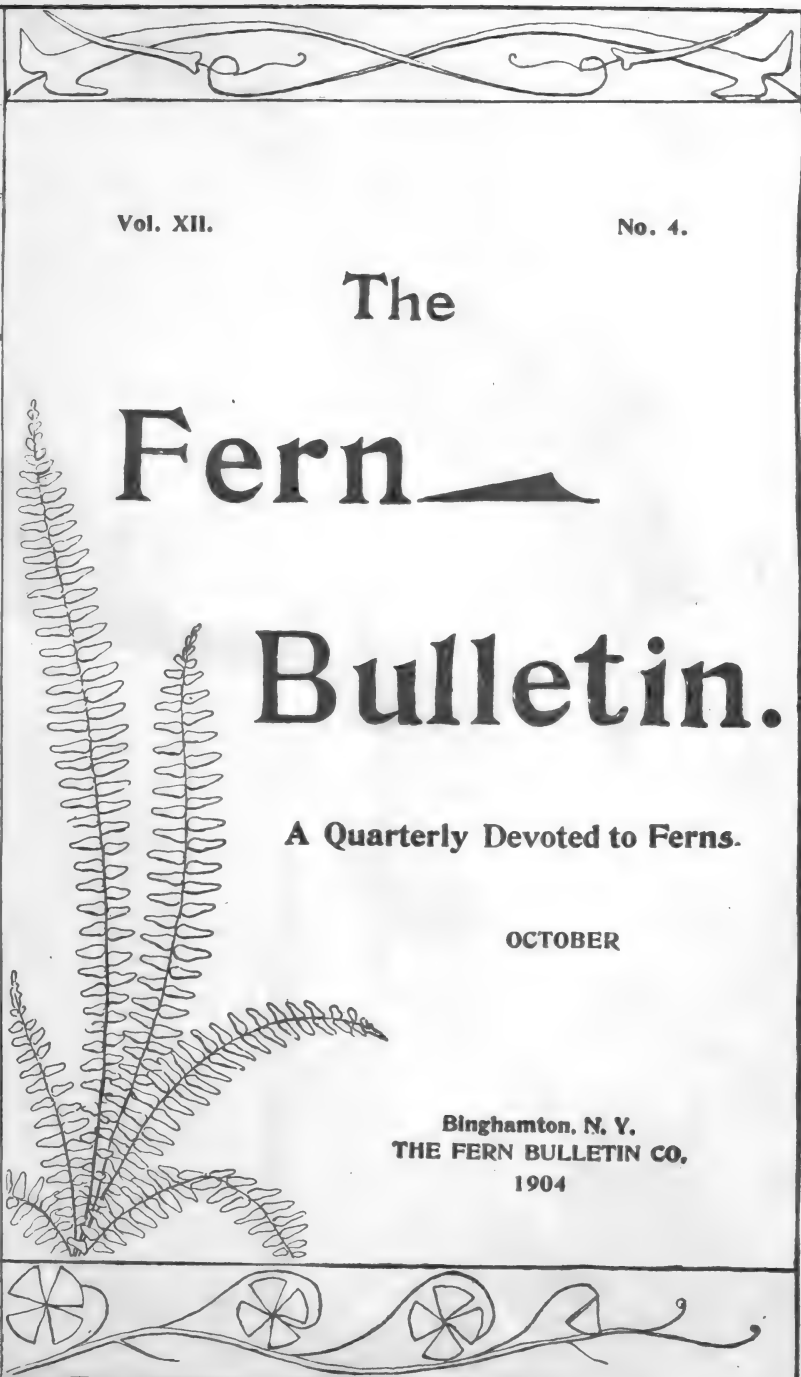
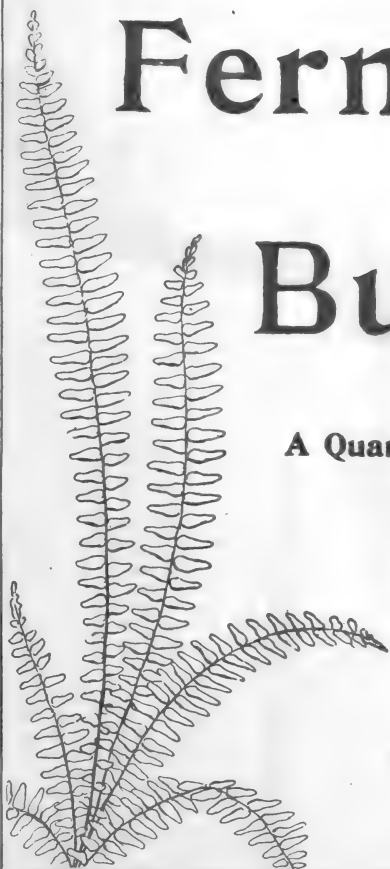
No. 4.

The Fern Bulletin.

A Quarterly Devoted to Ferns.

OCTOBER

Binghamton, N. Y.
THE FERN BULLETIN CO.,
1904



THE FERN BULLETIN

A QUARTERLY DEVOTED TO FERNS

WILLARD N. CLUTE, Editor

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FADYENIA PROLIFERA

THE FERN BULLETIN

VOL. XII.

OCTOBER, 1904.

NO. 4

THE FERN FLORA OF MONTANA.

By T. J. FITZPATRICK.

The fern flora of Montana is not strikingly extensive and is largely limited to the western half of the State, where the forests and the mountains reach their maximum development. The extensive plains of the eastern half of the State do not present congenial habitats for ferns, which necessarily are absent or nearly so. During the summer of 1902 the writer collected at various stations in western Montana while a member of a party of biologists from Chicago University. The results of personal work, together with information derived from various sources, make up the present paper, which is submitted for the perusal of fern lovers.

OPHIOGLOSSACEAE.

Botrychium Virginianum Swartz. RATTLESNAKE FERN. This eastern species was found to be frequent in rich woods in Flathead county during the months of July and August. The species was also collected at Tiger Butte in 1886 by R. S. Williams.

Botrychium lunaria L. Collected by R. S. Williams in the vicinity of St. Mary's Lake.

Botrychium Coulteri Underw. A plant apparently found only in geyser basins. Collected in Gallatin county by Mrs. Peter Koch.

Botrychium occidentale Underw. Collected by the writer along Swan river by the road leading from Flathead Lake to Swan Lake in Flathead county, Montana. Damp soil, woods, growing with *Gyrostachys stricta*, the tubers of which were found attached to the roots of this grapefern. In most of the specimens collected two leaves were found; the lower leaf arising immediately above the roots and sheathing the stem for a distance of from two to four inches, the sheath discontinuing at or near the surface of the ground. The upper leaf emanated shortly below the middle of the plant.

POLYPODIACEAE.

Woodsia scopulina D. C. Eaton. Common in rock crevices in the vicinity of Flathead Lake. This species was collected by the writer in the Lake McDonald region along the trail leading to Sperry Glacier and near its upper terminus. The species was also collected by Mr. Tweedy at West Boulder.

Woodsia oregana D. C. Eaton. Infrequent in shaded rocky soil, near Sperry Glacier, Lake McDonald region. Also collected by Mr. Flodman at Spanish Basin.

Woodsia obtusa Torr. Collected by R. S. Williams in Lower Sand Coulee. A rare species in Montana.

Cystopteris fragilis Bernh. Common in rock crevices and in rich rocky soil. During the months of July and August this species may be collected near the summit of the numerous mountain peaks in the region of Flathead Lake, also in the Lake McDonald region near Glacier hotel and by Sperry Glacier. Apparently a common fern throughout western Montana.

Nephrodium spinulosum Desv. Two specimens were collected by the writer in the vicinity of Glacier hotel in the deep woods near the upper end of Lake McDonald. Mrs. J. J. Kennedy has collected specimens in Missoula county. Seemingly a rare Montana fern.

Nephrodium filix-mas Rich. MALE FERN. This species was found by the writer near the summit of Mt. Eneas and along a small brook leading from a mountain meadow about five hundred feet below the summit. A few bunches were found along the upper portion of the trail from Glacier hotel to Sperry Glacier. A rather rare fern in Montana. The species has been collected in Park county, East Boulder, and Bozeman. Mr. Williams also collected the species at Lake Terry [McDonald], perhaps near the Glacier hotel.

Phegopteris dryopteris Fee. OAK FERN. Frequent in rocky soil in rich woods, also near springs or mountain streams, usually where there is considerable moisture, July to August. Collected by the writer at various points in the Flathead valley. The species has also been collected at Columbia Falls and Missoula and in Deer Lodge county.

Phegopteris alpestris Mett. Collected near the head of Lake McDonald by R. S. Williams,

Athyrium filix-foemina Roth. LADY FERN. Specimens were collected by the writer in rich woods in various localities in Flathead valley. The species seems to be rather common throughout the western half of Montana.

Asplenium trichomanes L. MAIDENHAIR SPLEENWORT. Collected in the Flathead valley at Columbia Falls by R. S. Williams.

Adiantum pedatum L. MAIDENHAIR FERN. This species was obtained by the writer along a mountain lake near Sperry Glacier in Lake McDonald region. The altitude was 7,000 feet, somewhat above the altitude usually given. The species has been collected in Deer Lodge county by Miss Hobson and at Lake Terry by R. S. Williams.

Cheilanthes lanuginosa Nutt. Rock crevices, infrequent. Collected at Ruby Cliffs in Madison county by Mr. Tweedy, in Missoula county by Mrs. Kennedy, and at Deep Creek by R. S. Williams.

Cheilanthes gracillima D. C. Eaton. Collected at McDonald's Lake by R. S. Williams.

Pellaea occidentalis Rydberg. In crevices of rocks. Collected in the Belt Mountains by Mr. Newberry; in Silver Bow county by Mrs. Moore, and at Tenderfoot Creek by R. S. Williams.

Pellaea atropurpurea Link. WINTER BRAKE. This species occurs but rarely in Montana, preferring rocky places. Collected in Tenderfoot Creek, Belt Canyon, by R. S. Williams.

Pellaea densa Hook. A rare Montana fern, collected by R. S. Williams near McDonald's Lake.

Pellaea gracilis Hook. SLENDER CLIFF BRAKE. Collected by R. S. Williams at Camass Lake.

Pteris aquilina L. BRACKEN. Frequent in the woods in the Flathead valley. Specimens were collected by the writer at Belton, a station near the summit of the Rocky Mountains on the Great Northern railway. Collected also at Columbia Falls by R. S. Williams, and at Missoula by Williams and Griffith.

Pteris aquilina lanuginosa Hook. Collected by the writer at Belton, Montana.

Cryptogramme acrostichoides R. Br. Rock crevices and slides, rather frequent in western Montana. Collected by the writer on the summit of Mt. Lincoln.

Polypodium vulgare L. POLYPODY. Among rocks, rare in Montana. Collected by the writer near Flathead Lake and at McDonald. Collected also at Columbia Falls by R. S. Williams.

MARSILIACEAE.

Marsilia vestita Hook. and Grev. Shallow water, reported as rare. This species has been collected by Geyer on the upper Missouri, by Williams on the Lower Sand Coulee, and by Watson on the Big Blackfoot.

EQUISETACEAE.

Equisetum variegatum Schleich. Collected by the writer along the sandy shore of the upper end of Swan Lake, infrequent. Collected along the Flathead river by R. S. Williams.

Equisetum scirpoides Michx. Collected at Columbia Falls by R. S. Williams.

Equisetum laevigatum Schleich. Common in meadows in the western half of Montana.

Equisetum robustum A. Br. Collected at West Gallatin by W. T. Shaw.

Equisetum fluviatile L. Collected at Columbia Falls by R. S. Williams.

Equisetum arvense L. Damp soil, infrequent. Collected in Lewis and Clark counties by Mrs. Muth; at Upper Sand Coulee by R. S. Williams, and at Grizzly Creek by Mr. Tweedy.

Equisetum arvense campestre Milde. This variety has been collected at Cedar Mountain by Rydberg and Bessey.

SELAGINELLACEAE.

Selaginella densa Rydberg. On gravel and exposed rocks, forming patches of considerable area. Common in the mountainous regions of Montana. The writer found this species ranging from the water's edge of Flathead Lake to the summit of the highest peaks.

LYCOPODIACEAE.

Lycopodium annotinum L. The writer collected this species in fruit near Belton along the road leading to Lake McDonald, August 15, 1902. It was associated with *Lycopodium complanatum* L. In this locality the species was common. Collected also at Lake Terry [McDonald] by R. S. Williams,

Lycopodium complanatum L. Collected by the writer in the woods at the upper end of Swan Lake; in the woods at the base of Mt. McDougal; and near Belton on the way to Lake McDonald. Infrequent except near Belton, where it was common. Collected at McDonald's Lake by R. S. Williams.

Lycopodium selago L. Collected in the vicinity of Lake Terry by R. S. Williams.

Lycopodium obscurum L. Collected in the vicinity of McDonald's Lake by R. S. Williams.

ISOETACEAE.

Isoetes bolanderi Engelm. The writer collected this species in quantity in shallow water along the shore of Swan Lake and along Flathead Lake near the club house, both stations being in the Flathead valley. The species was also collected at East Boulder by Mr. Tweedy.

Iowa City, Iowa.

NOTES ON AMERICAN FERNS: VII.*

BY WILLIAM R. MAXON.

THE STATUS OF *POLYPODIUM FALCATUM* Kellogg.—Several years ago the writer, in describing † *Polypodium hesperium*, the common polypody of the *vulgare* type in the mountain region of the Western United States, suggested incidentally that the description of *Polypodium vulgare* var. *occidentale* Hook. was, so far as it went, applicable to either of two forms occurring in western North America: (1) The so-called *P. falcatum* Kellogg, and (2) another form, especially abundant in Alaska, rather coriaceous in texture and commonly somewhat serrated as the var. *occidentale* was originally described. It was not suggested that these forms were specifically distinct; nor, in the light of further studies of recent large collections, does this appear to be the case. Rather are the two to be merged under one name, and the earliest name available is *occidentale*. A definite decision upon the identity of *occidentale*, however, involved an examination of Hooker's types preserved in the British Museum.

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†Proc. Biol. Soc. Washington 13: 200. 1900.

For the benefit of such an investigation the writer is indebted to Mr. W. F. Wight, who in the course of his studies abroad in 1903 kindly compared with the types a series of specimens from the U. S. National Herbarium.

Hooker's description of *P. vulgare occidentale* reads as follows: "Frondis laciniis acutis acute serratis," with the following data: "N. W. Am. On rocks and decayed wood, common near the confluence of the Columbia with the sea. Douglas. Sitcha. Mertens (in Herb. nostr.). * * * * * Mertens' plant from Sitcha, described by Bongard, is identical with the Columbian one." The statement that the Columbian and Sitcha plants are identical is substantiated by Mr. Wight's photograph of the types. The print shows plants about intermediate between the common coriaceous Alaskan plant and the ordinary Washington type with long attenuate pinnae. Under these circumstances and with much material to substantiate such a disposition the writer has little hesitation in giving the name *occidentale* to the whole series. The synonymy, then, will be as follows:

POLYPODIUM OCCIDENTALE (Hook.)

Polypodium vulgare L. var. Spreng. Syst. Veg. 4: 52. 1827.—
Bongard, Mem. Acad. Petersb. Vi. Sci. Math. Phys. Nat. 2: 175.
1832.

Polypodium vulgare occidentale Hook. Fl. Bor. Am. 2: 258.
1840.

Polypodium falcatum Kellogg, Proc. Calif. Acad. Sci. 1: 220.
1854.

Polypodium glycyrrhiza D. C. Eaton, Am. Journ. Sci. II.
22: 138. 1856.

As thus delimited the species include plants ranging from California to Alaska, where it seems especially abundant in the Sitka region. It is highly variable, and if intermediate specimens immediately dependent upon habitat for their peculiar features were to be disregarded it would be possible to recognize several forms. There is, in the U. S. National Herbarium, a good series of plants from Washington, collected by Mr. J. B. Flett. Such of these as grew about the roots of trees or upon rocks, and thus more or less exposed, are unmistakably the same as the average Alaskan plant; it is only those which grew in well shaded situations, on rotten logs and in living trees (Flett 2031, 2033), that

show the greater size of the frond and the long attenuate pinnae hitherto regarded as distinguishing *P. falcatum*. But certain individual plants of 2032 show the transition from the one form into the other in the shape of the pinnae. Other diagnostic characters upon which to base a segregation there are none; and the conclusion is inevitable that the entire series, however different the extremes, represents but a single species. The propriety of recognizing the so-called *falcatum* as a mere local form is a matter for individual judgment, but it appears to the writer to be neither desirable nor necessary.

The writer proposes to publish soon a series of illustrations indicating the more noteworthy normal variations of this species along the western coast, mainly in Washington and Alaska.

ASPLENIUM PYCNOCARPON Spreng.—*Asplenium angustifolium* Michx. (Fl. Bor. Am. 2: 265. 1803) is invalidated by *Asplenium angustifolium* Jacq. (Collect. 1: 121. 1786.—Ic. Pl. Rar. 1: pl. 199. 1781-1786), a name applied to plants from the Straits of Magellan. The next name available for our "narrow-leaved spleenwort" of eastern North America appears to be *Asplenium pycnocarpon* Spreng. (Anleit. Kennt. Gew. 3: 112. 1804), which in its allusion to the crowded sori is as appropriate as Michaux's name—in its reference to narrow *leaves* rather than narrow *pinnae*—is unfortunate.

FALL FRUITING OF OSMUNDA.

By W. C. DUKES.

Strolling along the eastern shore of Mobile bay, September 25th, searching for *Botrichium dissectum*, I happened upon a colony of *Osmunda cinnamomea*, and my attention was arrested by two plants in the middle of this colony with two well developed fertile fronds, although each pinnae was broader than those carried by the normal fertile frond in the early spring time.

It surprised me, as I had never before seen this fern set spores at this season of the year. All of the other members of this colony were devoid of any attempt to show fertile spikes. A close examination also failed to show any indications of injury, which might account for this condition.

These two were, as stated, in the midst of the colony, with the others, as it were, standing guard over these two precocious individuals, who were perhaps wooed by the gentle breezes of the Gulf into forgetfulness of the season.

I would like to know if this is a "family trait," or merely a "freak" occasioned perhaps by jealousy of their neighbors, the *Woodwardia*, burdened with their treasure-laden spikes?

Mobile, Ala.

[Similar instances of the cinnamon fern fruiting in autumn have been reported in this journal from Florida. So far as we are aware it does not occur in the North, but southward it seems to be noticed frequently. It may be added that plants in certain parts of the world have two resting periods, one caused by the heat of summer, the other by the cold of winter. Possibly the cinnamon fern in the South is in such a position. In that case it is likely that the spring-like autumn days may cause a few fertile fronds to put forth. It would be interesting to know how general the habit is. In the West Indies this species fruits in early February and in Louisiana before the end of March.—Ed.]

THE BROAD WOOD FERN IN WASHINGTON.

By A. S. FOSTER.

On the coast about the mouth of the Columbia river and in the vicinity of Gray's Harbor, Wash., *Nephrodium spinulosum dilatatum* grows very abundantly, fronds reaching the size of twenty inches broad by thirty-six inches long; whatever size the fronds may be the width is generally one-half the length. As one goes inland the size grows smaller, usually, but I enclose you opposite pinnae, about the fourth from the bottom, from a frond over six feet long—sixteen to one plant—truly and tropically royal. Not three feet distant was another *N. spinulosum dilatatum* of the other extreme, fronds twenty to twenty-four inches long. These grew on the banks of the Willamette river, below Oregon City two or three miles. Date June 15, 1904.

On August 21st, in Ca-né-mah Park, Oregon City, I found several plants of *N. spinulosum* of the rock-loving kind, presumably the mountain species, with fronds four times as long as wide, four inches—sixteen inches. The fronds are more leathery,

not so thin and fragile as on the coast, and the indusium is persistent and strong. The sori are not so numerous, only the upper third of the pinnae being fertile.

Polypodium hesperinum is found on the face of rocky bluffs (volcanic) along the Columbia river near Multnomah Falls, in company with *Woodsia scopulina* and *Cryptogramma acrostichoides* growing at the foot of the bluff. *Asplenium trichomanes* was found on Hicklin Bluff, near Troutdale, Oregon, at the mouth of Big Sandy.

Hamilton, Wash.

BABYHOOD OF FERNS.

By W. C. DUKES.

Many fern-lovers who have grown ferns for years are unacquainted with the manner in which they reproduce themselves. While these delicate plants have adopted a most complicated mode of reproducing themselves, nevertheless they adhere to nature's universal law of the union of the sexes. The little brown purses we find upon the reverse side, and along the margins of the fronds, in many different shapes, are the earnest of coming generations, and these little eccentric vessels, instead of following the set rule of seeds and directly reproducing themselves, prefer to develop a flat, green, scale-like organ known as the prothallus. When the spores first germinate they have a mossy look which the uninitiated might mistake for some of the musci, but they soon assume the characteristic shape of the prothallus, and it is during this stage that one's interest is stimulated watching their development. In four or five weeks, under favorable conditions, the young sporophyte will be seen springing from the axis of the lobed prothallus and should then be transferred into small pots as soon as their individuality is assured.

The writer has found a successful way of handling the spores, is a Warden case, in which are glass finger bowls half filled with water, in which the pots are set; the earth used was a sandy mould from the woods, first subjected to two applications of boiling water in order to destroy such animalculæ as would prove harmful to the spores or prothallus. A small quantity of bone dust and slacked lime added has been found beneficial.

The top and part of the sides of the case was covered with a curtain made of black enameled duck, to afford the necessary shade and to keep the rain from injuring the case. The case was placed where it got full sunlight from morning until about 3 p. m. That produced a warm, damp atmosphere which seemed to fill the conditions wanted.

A jeweler's double-lens eyeglass will be found convenient for close examination, as it can be held on the eye and allow free use of both hands. These remarks will be brought to a close with the hope that they may stimulate others to try this fascinating branch of culture, and thus add many interesting facts to the history of the young fern.

Mobile, Ala.

NEPHRODIUM PITTSFORDENSIS.

By G. A. WOOLSON.

The remarks "Concerning Forms and Hybrids" in the July BULLETIN greatly interest me. As a life-long resident of Pittsford and I trust a loyal citizen, I must beg Mr. Clute to remember that "some have greatness thrust upon them." The pretty compliment paid us by a summer resident is properly appreciated by the small fraction of the population who have chanced to hear of *Nephrodium Pittsfordensis*. If scientific canons have been violated in the formal christening of the new hybrid, it is to be hoped that it will not be counted as a cardinal sin and that we may be permitted to retain our "one ewe lamb."

As for its validity as a hybrid I have no doubt. I saw the original plant described in the April, 1904, *Rhodora*, probably in '95 or '96. It was growing beside a stone wall, and was flanked on one side by a good lusty *marginalis* with a type *spinulosa* on the other. The resemblance of the plant to its immediate neighbors was so marked that I unhesitatingly pronounced it a hybrid between the two. As I was not the discoverer, I did not mark the X upon the wall. I am aware that jumping at conclusions is a dangerous doctrine to preach to the amateur botanist, but I can but think that nature must now and then laugh in her sleeves at the amount of time and trouble taken by the over-discreet among us to demonstrate a problem, the solution of which is already before our eyes.

When I received a complimentary copy of the aforesaid *Rhodora*, I gave myself the pleasure of sending an "I told you so" through the mail with befitting comments. Had Mr. Clute seen the plant as I saw it, in the midst of suspicious environment, I doubt if he would have considered it "sheer nonsense to make so much of a variant form." I have faith to believe that a "recurvatum" of sentiment is yet in store for unbelievers.

Now for my own story: I have made no change for years in a certain section of the fern-border which flanks one side of my house. All additions are of nature's own. Near the corner where the porch joins the house is a fine *marginalis*. A few feet from this fern is another angle formed by the steps extending to within perhaps six inches of the front corner of the porch. In this little nook a small plant of *Spinulosa* var. *intermedia* has had a hard struggle for life; the fronds were invariably broken down or trampled by misplaced feet.

Early in the season just passed I noticed that my *intermedia* was making a much finer growth than usual. Some of the fronds were so beautiful that I thought seriously of potting the plant for decorative use indoors for the summer, rather than leave it to its usual fate. This I was prevented from doing by an illness which confined me to my room for a month. When I again crossed my own doorstep, I paused and considered the unusual fronds at my feet. In my growing collection of forty-odd ferns I had nothing like it. Through some witchery in nature the color and texture of the *marginalis* had fallen upon a supposedly unquestionable *intermedia*.

Examination of the root-growth showed that these fronds came from a well-developed crown resembling that of *marginalis* crowding out from under the side of the steps. There are also two lesser crowns, one is a genuine *intermedia*, but the other may be an offset of the other. However, even in behalf of science, I refuse to disturb the root-growth at present. A number of fronds were sent to Mr. Davenport, who identified my fern as *N. Pittsfordensis* and wished to know if it came from Miss Slosson's station. Assuredly it did not, for that is two miles away. As I remember Miss Slosson's plant, I should say that it differed from mine about as much as the type differs from its variety *intermedia*. The environment of both plants certainly favors the theory of hybridity.

Mr. Clute is right in his estimate of the prolific possibilities of *N. spinulosa*. The species may be taking town orders in the near future. In spite of deprecatory remarks on this or that recurved or befrizzled *forma* of an established type, I consider the creation of a new station practically under my feet, for the recently introduced celebrity, a compliment which nature does not vouchsafe to pteridomaniacs at large.

Pittsford Mills, Vt.

NOTES ON THE FERNS OF WASHINGTON.

By T. J. FITZPATRICK.

During the month of August, 1902, the writer spent a short time at Skykomish, Washington. This village is situated on the Great Northern railway in the heart of the Cascade mountains, near the central portion of the State. Extensive coniferous forests abound in all the region round about. There seemed to be an abundance of moisture and plant conditions were strongly mesophytic. Special attention was given to the ferns and specimens were collected of all the species found. A few days previous a visit was made at Wenatchee, Washington, on the Columbia river. This station, situated to the east of the Cascade range on the Great Northern railway, is the county seat of Chelan county, and is near the geographical center of the State. At the time of the writer's visit the dry season was in full force and the only plants available were those growing where there was plenty of moisture, as along the river, in pools, or along irrigation ditches, or those of xerophytic tendencies which, being in their element, naturally thrived. No ferns were found. Mr. Kirk Whited, of Wenatchee, gave the writer a number of ferns which he had collected in various near-by stations. The writer during a day's botanical work in August, 1902, at Spokane, near the eastern boundary of Washington, failed to discover any ferns growing.

From the ferns presented by Mr. Whited and those collected at Skykomish, the following list with notes is made up in the belief that it will add something of interest to the fern flora already prepared by Mr. Flett and published in **THE FERN BULLETIN**.

POLYPODIACEAE.

Nephrodium spinulosum Desv. Two specimens only were found and collected at Skykomish. Habitat, deep woods; apparently rare.

Woodsia scopulina D. C. Eaton. Collected by Kirk Whited, July 6, 1901, at Rainbow Falls at the head of Chelan Lake, Chelan county, Washington. This fern dries up when exposed to the sun during the summer season.

Phegopteris dryopteris (L.) Fee. Frequent in the rich woods at Skykomish. Collected by Kirk Whited at Stevens Pass on the Great Northern railway.

Adiantum pedatum L. Frequent in rich woods along the river in the vicinity of Skykomish. Specimens were observed nearly three feet in height, much exceeding those usually found in the Midland States.

Pteris aquilina lanuginosa Hook. Underw. Frequent in open places at Skykomish. Also collected in Chelan county, Washington.

Polypodium falcatum Kellogg. Frequent on the trunks of trees at Skykomish. The sight of a bed of ferns displayed on the side of a tree is a novelty to a resident of the midland region. The ferns seem to be striving to rise above the excessive shade and moisture present at the surface of the ground.

Lomaria spicant Desv. Frequent in the rich fir woods in the vicinity of Skykomish. The thrifty fronds were found growing in large clumps.

Polystichum Lemmoni Underw. Growing in the crevices of the rocks, Mt. Stuart. Collected by Kirk Whited, July 20, 1898. Underwood in "Our Native Ferns," 6th edition, mentions for locality, "near Mt. Shasta, California."

Polystichum munitum inciso-serratum D. C. Eaton. Seemingly frequent in rich fir woods in the vicinity of Skykomish. A specimen is at hand collected near Montesano, Chehalis county, by A. A. and E. Gertrude Heller.

Cheilanthes gracillima D. C. Eaton. Collected by Kirk Whited on the mountain side near the head of Lake Chelan, July 5, 1901.

EQUISETACEAE.

Equisetum telmateia Ehrh. Collected in Chelan county, April 14, 1901, by Kirk Whited. Conspicuous by its ivory white stem.

LYCOPODIACEAE.

Lycopodium annotinum L. Rich woods, Skykomish, frequent. Specimens eight to ten feet long were collected.

SELAGINELLACEAE.

Selaginella rupestris (L.) Spring. Collected by Kirk Whited in Tumwater canyon, Chelan county, August 28, 1901.

Iowa City, Iowa.

NOTES FROM LOUISIANA.

By R. S. Cocks.

AZOLLA CAROLINIANA WILLD.—During the past summer there has been a most extraordinary growth of Azolla in a small pond in Audubon Park, New Orleans. Between the months of June and September no less than fourteen cart loads, weighing perhaps seven tons, were removed from a sheet of water not more than one-fourth of an acre in area. On an average the growth had to be removed every twelve days. The writer would very much like to know whether such extraordinary luxuriance has been elsewhere reported.

ADIANTUM PEDATUM L.—In the "Fern-flora of Louisiana" by Mr. Clute and the writer this fern was only tentatively included, as no undoubted specimens from the State had been seen. Since then specimens have been procured from near Baton Rouge through the kindness of Dr. Billings, the State Botanist, and also from another station, so that this fern can now be safely added to our list.

ADIANTUM CAPILLUS-VENERIS L.—In the writer's opinion, his friend Mr. Clute to the contrary notwithstanding, this fern should be stricken out of our flora. In its natural state it invariably is found on limestone banks with water trickling over it, and in the whole of Louisiana, so far as the writer knows, no such situation exists. In his opinion it is not found in a natural condition in the cemetery from which Mr. Clute reported it, nor would it remain there very long unless occasionally assisted by gardeners and other friends. Dr. Small in his flora states that *A. capillus-veneris* is "rare or local; south to Florida and Louisiana." "Rare and local" are not very happy

adjectives to describe its growth in Alabama, where it can be collected by the wagon load anywhere along the Alabama river from Mobile to Montgomery, a distance of three hundred and fifty miles. It is also extremely common along the limestone banks of the creeks in which that State abounds.

While on the subject of Prof. Small's Flora, the writer perhaps may be allowed to express his opinion that for a volume which professes to give the "known distribution" of the plants of the Southern States, it is rather disappointing from the point of view of Louisiana. While perhaps it was not to be expected that every plant known to occur in Louisiana should be credited to the State, it certainly is remarkable that such a plant for instance as *Piaropus crassipes*, the water hyacinth, which for about fifteen years has choked up nearly every water-course in Louisiana and on the extermination of which large sums of money have been spent, should be assigned only to Florida and tropical America. This is only given as one instance out of very many which the writer proposes to give on a more suitable occasion.

New Orleans, La.

[The editor found *A. capillus-veneris* growing in the mortar between the bricks in old graves in Girod cemetery, New Orleans. In such positions it could surely not have been planted, for it rooted in such narrow crevices that the plants could scarcely be dislodged with a knife. The caretaker of the cemetery stated that the fern grew naturally, thought it is doubtless favored by those interested in the graves, since it forms a most beautiful and delicate covering for the ugly bricks and mortar. The point we would make is this: The plant thrives in locations where it has not been planted, and therefore should be considered a naturalized plant, just as is its companion, *Pteris longifolia*. That *A. capillus-veneris* has ever been found native in Louisiana, is, as Mr. Cocks observes, open to doubt, but that it is sparingly naturalized seems fairly proven.—Ed.]

—From the Warren County (Ky.) *Courier* we learn that the herbarium and sketches of the late Miss S. F. Price have been deposited at the Missouri Botanical Garden, St. Louis.

THE JAMAICA WALKING FERN.

(*Fadyenia prolifera*.)

BY WILLARD N. CLUTE.

Walking ferns, in the sense of ferns whose fronds bend over and take root at the tip, are fairly common in the fern world. Our own most noted example is the interesting little *Camptosorus rhizophyllus* not uncommon on limestone rocks, but we have several others that occasionally root at the tip, such as the hartstongue (*Scolopendrium vulgare*), the ebony spleenwort (*Asplenium ebeneum*), the pinnatifid spleenwort (*A. pinnatifidum*) and that curious hybrid named *Asplenium ebenoides*.

In the colder parts of the Old World *Camptosorus sibericus*, a species much like our walking fern, is found, but we must turn to the Tropics to find walking ferns in abundance. In Jamaica, especially, there are numerous species with this habit. One of the most characteristic is the one we have selected for illustration under the title of the Jamaica walking fern. *Fadyenia*, as it is often called, has more claim to our attention than the mere fact that it is a walking fern. It is the only fern of its kind in the world and the entire genus *Fadyenia* consists of this single species *prolifera*. Its fronds, too, are odd enough to distinguish it anywhere. There are first certain round-ended or spatulate fronds for purely vegetative functions, oftenest seen in young specimens; second, there are other lanceolate tapering fronds which do the "walking" and which are manifestly later leaves like the first form, but with prolonged, slender tips, and lastly there are the paddle-shaped fertile fronds which are like neither of the others. The margins of all are entire.

This species grows on springy banks in the open sun or partial shade and in certain localities is very plentiful. The rather thick and leathery sterile fronds spread out in the form of a rosette and the slender tips rarely fail to produce new plants which, in the genial climate of their habitat, soon reach the size of their parents. The fertile fronds are erect and their manner of fruiting, though allied to the wood-ferns, differs enough to cause the species to be placed in a separate genus. On each side of the mid-rib is a single row of horse-shoe-shaped sori pointing toward the tip, covered by oval indusia fixed by the

center and base and open all round the outer margin. The sori have a general resemblance to those of the wood fern (*Nephrodium*) tribe, and as might be surmised the genus is placed with them in the tribe Aspidieae, which also includes the sword ferns (*Nephrolepis*). The sori are unusually large and occupy most of the space on the narrow fronds.

The fronds of the Jamaican walking fern are scarcely longer than those of our familiar native species, but the sterile are much broader and the plant appears much larger in consequence. By many it is supposed to grow only in Jamaica, but it has been reported from Cuba, also. Jamaica, however, appears to be the only land where it is abundant.

PELLÆA ORNITHOPUS.

By A. A. EATON.

Growing upon the face of bare rocks, wherever a natural crevice and the elements have formed a proper foothold and soil, exposed through eight months in summer to the uninterrupted glare of the burning sun, with no possible chance of getting a drop of water, where no dew ever falls and no passing shower refreshes, with few companions hardy enough to dispute its claim in its chosen province, grows the black fern (*Pellaea ornithopus*). It is often called poison fern, but never receives the more appropriate name of bird's foot cliff-brake.

The fronds are from three to twelve inches in height, rigidly erect, with the appearance of dignity which is conscious of want of majesty. The smooth and shining rachises and stipes of a dark chestnut or almost ebony color give it one of its popular names, while the other comes from its reputed poisonous effect on sheep, the only herbage eating animal (with the exception of the cottontail) nimble enough of foot to intrude on its chosen domain. The pinnulae are set in threes and revolute in order to hoard what scant moisture they possess through exposing as small surface as possible to the hot winds. This gives them a cylindrical appearance, not remote in resemblance to a bird's foot, whence Hooker drew the name. Their color is bluish or lead tinted, and the whole plant has a stiff, dry aspect, as though generations of drying had extracted the sap and

flexibility it formerly possessed in common with other ferns, and had left nothing but pride of ancestry, that empty husk which is so often mistaken for greatness.

The rootstock is short, stout and densely covered with scales of a light brown color, resembling somewhat a small rabbit's foot. This usually creeps just beneath the surface. As it branches freely the ferns are usually in clumps. Strange as it may seem, this makes an elegant house-plant. I sent one home from California in 1891. On my return in 1893 it was a fine large specimen, having over seventy-five fronds on it, some of them over a foot long. These were trained in the form of a fan, and extended from one side of the pot to the other, their stiffness keeping them in place.

Seabrook, N. H.

FORKING FERNS.

BY AUG. H. HAHNE.

In recent years many cases of forking ferns have been described in European and American botanical journals. Some of them are well known to the readers of the FERN BULLETIN. It is impossible and not in my intention now to give a detailed account of the supposed manner of their origin, of their inheritance and of their importance in the interpretation of phylogenetic and palaeontological facts. I hope to do so in a short time and think it will be of interest for fern-hunters to read about the cases observed hitherto by myself. Forking is found in the main rachis of the fronds as well as in their segments of every range, sometimes increased to the degree of an entirely crested or tasselled habit of the tops. All bifurcations of the rachis are called *formae furcatae*, excepting those in which the forking extends into the stalk. These are named *formae geminatae*. When dichotomy is repeatedly to be found, there is a *forma cristata* if furcations are crowded together at the tops of the fronds or segments, and a *forma ramosa* if they are loosely dispersed all over the frond. A combination of these, now and then to be seen, may be called *forma ramocristata*, and every kind of segment-forking *forma bifida*.

In the following list, specimens only of my own collection are mentioned, except cultivated forms generally known, about which an immense amount of information may be found in the works of Moore and Lowe and other fern authors. Only those which are little known or which have spontaneously arisen in my cultures are mentioned. I do not intend to compile now the great number of cases scattered in the botanical literature of the whole world. This may be done later.

Trichomanes diaphanum H. B. K. f. *furcata*. Colombia.

Hymenophyllum Blumeianum Spr. f. *furcata*. Ceylon.

Hymenophyllum obtusum Hook. Arn. f. *furcata*. Hawaii.

Hymenophyllum bivalve Sw. f. *furcata*. New Zealand.

It is difficult to seek for *Hymenophyllum* and *Trichomanes* furcations in herbarium specimens on account of their growing too thickly to be well discerned.

Woodsia polystichoides Eat. var. *incana* mh. f. *bifida*. Cultivated.

Woodsia obtusa Torr. f. *bifida*. Cultivated.

Cystopteris fragilis L. f. *bifida* and f. *furcata*. Rhenish Provinces.

Cystopteris montana Bernh. f. *bifida*. Stiria.

Nephrodium Miyashianum Mak. f. *bifida*. Japan.

Nephrodium phegopteris Baumg. f. *bifida*, and f. *furcata*. Hessia.

Nephrodium polypodiiforme Mak. f. *bifida*. Japan.

Nephrodium decurrens (Raddi) f. *bifida*. Cultivated.

Nephrodium gracilescens Hook. f. *bifida*. Ceylon.

Nephrodium thelypteris Desv. f. *bifida*. Rhenish Provinces.

Nephrodium montanum Bak. f. *bifida*. Rhenish Provinces.

Nephrodium filix-mas Rich. f. *bifida* and f. *furcata*. Rhenish Provinces.

Nephrodium erythrosorum Hook. f. *bifida*. Cultivated.

Nephrodium rigidum Desv. f. *bifida*. Switzerland.

Nephrodium spinulosum Desv. f. *bifida*, Hamburg; f. *furcata*, Rhenish Provinces. Westfalia.

Nephrodium spinulosum x *cristatum* (Lasch.), *f. furcata*.
Rhenish Provinces.

Nephrodium cristatum Desv. *f. furcata*, Potsdam; *f. cristata*,
Silesia.

Aspidium trifoliatum L. *f. cristata*. Cuba.

Fadyenia prolifera Hook. *f. furcata*. Cultivated.

Polystichum lonchitis Roth *f. bifida* and *f. furcata*. Switzer-
land.

Polystichum lobatum Presl. *f. furcata*. Rhenish Provinces.

Polystichum polyblepharum (Roem.) *f. bifida*. Cultivated.

Polystichum aculeatum Roth *f. bifida* and *f. geminata*. Rhen-
ish Provinces.

Polystichum Braunii Diels *f. bifida*. Caucasus.

Nephrolepis philippinensis *f. furcata*. Cultivated.

Lindsaya triquetra Christ. *f. bifida*. New Guinea.

Athyrium filix-foemina Roth *f. bifida* and *f. furcata*, Rhenish
Provinces; *f. cristata*, Westmoreland.

Athyrium Michauxii Sprgl. *f. furcata*. North America.

Scolopendrium vulgare Smith *f. furcata*, Rhenish Provinces,
Westmoreland; *f. cristata*, Rhenish Provinces.

Asplenium hemionitis L. *f. furcata*. Azores.

Asplenium viride Huds. *f. furcata*, Westmoreland; *f. cristata*,
Wurtemberg.

Asplenium trichomanes L. *f. furcata*. Hessia.

Asplenium ruta-muraria L. *f. furcata* and *f. geminata*. Rhenish
Provinces, Switzerland.

Asplenium adiantum-nigrum L. *f. cristata*. Riviera.

Asplenium lanceolatum Huds. *f. furcata*. Ireland.

Asplenium fontanum Bernh. *f. bifida* and *f. furcata*, Scotland;
f. cristata, Scotland, Switzerland.

Asplenium Fabianum Moore *f. furcata*. Cultivated.

Ceterach officinarum Willd. *f. bifida*. Rhenish Provinces.

Ceterach aureum Link *f. furcata*. Teneriffe.

Blechnum hastatum Kaulf. *f. bifida*. Chile.

Blechnum brasiliense Desv. *f. furcata*. Cultivated.

Blechnum gibbum Mett. *f. furcata*. Cultivated.

Blechnum hastatum Kaulf. *f. bifida*. Chile.

Blechnum spicant Wish. *f. bifida*, *f. furcata*, *f. geminata* from different places in Germany and England; *f. cristata*, Hessia.

Blechnum occidentale L. *f. bifida*, Guadeloupe and cultivated; *f. cristata*, cultivated.

Blechnum longifolium H. B. K. *f. bifida* and *f. cristata*. Cultivated.

Woodwardia radicans J. Sm. *f. bifida*, Italy; *f. cristata*. Cultivated.

Doodia aspera Brown *f. furcata*. Cultivated.

Anogramme schizophylla Diels *f. furcata*. Cultivated.

Gymnogramme sulfurea Desv. *f. furcata*. Cultivated.

Gynogramme Steltzner Kosh *f. furcata*. Cultivated.

Gymnogramme Wettenhalliana Moore *f. cristata* and *f. ramocristata*. Cultivated.

Neurogramme calomelanos Diels *f. furcata*. Cultivated.

Neurogramme ochracea Presl. *f. cristata*. Cultivated.

Pellaea atropurpurea Link *f. bifida* and *f. furcata*. North America.

Pellaea ternifolia Fee *f. bifida*. Cultivated.

Pellaea viridis Prantl *f. furcata*. Cultivated.

Doryopteris pedata Smith *f. furcata*. Cultivated.

Cheilanthes farinosa Kaulf. *f. bifida*. Cultivated.

Hypolepis Californica Hook. *f. furcata*. California.

Cryptogramme japonica Prantl. *f. furcata*. Cultivated.

Adiantum hispidulum Sw. *f. bifida*. Cultivated.

Pteris serrulata L. fil. *f. furcata* and *f. geminata*. Cultivated.

Pteris tremula L. *f. furcata* and *f. cristata*. Cultivated.

Pteris nemoralis Willd. *f. bifida*. Ceylon.

Pteris longipes Dow. var. *pellucens f. bifida*. Philippines.

Pteridium aquilinum Kuhn *f. bifida*, *f. furcata*, Rhenish Provinces, Westfalia; *f. cristata*, Hessia, Prussia.

Polypodium sp. *f. furcata*. Cultivated.

Polypodium aureum L. *f. bifida*. Cultivated.

Polypodium vulgare f. bifida, f. furcata, f. cristata. Germany.

Polypodium phyllitidis L. *f. furcata*. Cultivated.

Polypodium irioides Lam. *f. bifida*. Cultivated.

Polypodium vacillans Link *f. bifida*. Cultivated.

Polypodium Walkeri (Thwaites) *f. bifida*. Cultivated.

Acrostichum aureum L. *f. cristata*. Brazil.

I beg American fern-lovers to hunt further for monstrosities of this kind, to make them known in the FERN BULLETIN, and also to add information about the physical and climatic circumstances of the localities.

Bonn, Germany.

NEW STATIONS FOR TWO RARE CONNECTICUT FERNS.

July 13, 1904, I found three small colonies of *Pellaea gracilis* in the town of Salisbury. The fronds were beginning to show the effects of hot weather, but I secured quite a few, both sterile and fertile. The plants in each colony were growing in the soil—not on the rocks, as I have seen them elsewhere.

October 19, 1904, *Asplenium montanum* previously reported from North Stoughton and East Haddam (Bishop's Catalogue of Connecticut Plants), was found on cliffs within half a mile of the Massachusetts line. This moves its northern limit about thirty miles further.

October 22, 1904, other colonies of this fern, in very vigorous condition, were found at a distance of about three miles from the first station.—*Orra Parker Phelps, Chapinville, Conn.*

ASPLENIUM RUTA-MURARIA ON THE TOWERS OF MILAN CATHEDRAL.

While on a tour through Europe, last summer, I found the Wall-rue on many dry walls, old roofs and steep cliffs. I found it especially common in France, Switzerland and Italy. It is often associated with *Sempervivum tectorum* L. But the greatest surprise came when I found it flourishing in the crevices of one of the towers of the famous Gothic cathedral at Milan, Italy. As is well known, the whole exterior of this grand old *Duomo*, including the roof, the ninety-eight pinnacles, the 2,000 statues as

well as the towers are all composed of Carrara marble. The cathedral stands in the central part of the city of 500,000 inhabitants, and the highest point at which I observed the fern was about 270 feet.—*J. Schneck, Mt. Carmel, Ill.*

OWNERS OF COMPLETE FILES.

When we suggested, in the July number, that it would be interesting to know who possesses full files of THE FERN BULLETIN, we had no idea that the number was so small. Doubtless there are several others yet to be heard from, but the list at present is as follows:

Libraries: Boston Public Library, Massachusetts Horticultural Society, Columbia University, Michigan Agricultural College.

Private Owners: Prof. T. J. Fitzpatrick, Iowa City, Ia.; O. M. Oleson, Fort Dodge, Iowa; James A. Graves, Susquehanna, Pa.; Mrs. M. L. Stevens, Brookline, Mass.; John H. Sage, Portland, Conn.; Miss H. D. Hutchinson, Mattapan, Mass. The editor has two copies.

Since full files are becoming so rare, it is desirable that the whereabouts of every one be known. If any other reader has such a file, we trust they will inform us of it. A postal card will be sufficient.

CURRENT LITERATURE RELATING TO FOREIGN FERNS.

CONTRIBUTED BY AUG. H. HAHNE.

- BOLUS, H., & A. H. WOLLEY-DOD, *Ferns of the Cape Peninsula*. Trans. South African Phil. Soc., XIV (1903), pp. 363-5.
- BARBAS, V. v., *Aspidium thelypteris* var. *brachytomum* Barb. var. *nov.* Magyar Botan. Lapok, II (1903), p. 256.
- CHAUVEAUD, G., *Recherches sur le mode de formation des tubes criblées dans la racine des Cryptogames Vasculaires et des Gymnosperms.* (Researches on the mode of formation of sieve tubes in the root of the Vascular Crypt. a. Gymnosperms). Ann. Sci. Nat. XVIII (1903), sér. 8, pp. 165-279.

- CHIOVENDA, E., *Sul nome di alcune felci nostrali*. (On the names of some native Italian ferns). Ann. di Bot. Girotta, I (1903), pp. 208-10.
- CLOS, D., *Sur une nouvelle localité française de l'Hymenophyllum tunbridgense*. Bull. Soc. Bot. France, I (1903), pp. 592-4.
- FIELD, H. C., *Note on hybrid ferns*. Trans. Proc. New Zealand Inst., XXXV (1903), pp. 372-3.
- GEZE, J. B., *Note sur la présence de l'Asplenium viride Huds. dans les environs de Toulouse*. Bull. Soc. Bot. France, I (1903), pp. 481-2.
- GWYNN-VAUGHAN, D. T., *Observations on the anatomy of solenostelic ferns*. Ann. of Bot. XVII (1903), pp. 689-743, (3 pls.)
- HEY, W. C., *Asplenium adiantum nigrum in East Yorkshire*. Naturalist, 1904, p. 32.
- HIERONYMUS, G., *Selaginellae novae*. (Descr. of three new West Indian species) Urban's Symbolæ Antillanæ, III (1903), pp. 524-7.
- HIERONYMUS, G., *Selaginellarum species novae vel non satis cognitae, II. Selaginellae es subgenere Heterophyllo*. (Descr. of 44 species). Hedwigia, XLIII (1904), pp. 1-65.
- JOHNSON, T., *Tyloses in the bracken fern. (Pteris aquilina L.)* Proc. R. Soc., Dublin, X (1903), pp. 101-3. (1 pl.)
- KRIEGER, W., *Die Formen und Monstrositäten von Polypodium vulgare L. in der Umgebung von Königstein (Sachsen)*. Hedwigia, XLIII (1904), pp. 74-7.
- KUHN, M., AND OTHERS, *Flora Portoricensis. Pteridophyta*. (254 species from Porto Rico). Urban's Symbolæ Antillanæ, IV (1903), pp. 1-70.
- LEVEILLE, H., *Ouillques fougères anormales da Maine*. Bull. Soc. Agric. Sci. Art. Sarthe. sér. 2, XXXI (1903), p. 176.
- LUERSSSEN, CHR., *Botanische Ausbente einer Reise durch die Sinai-Halbinsel von A. Kneucker Pteridophyta*. Allg. Bot. Zeitsche, 1903, pp. 184-5.
- MACLOSIE, G., *Pteridophyta (collected in Fuego and Patagonia by J. B. Hatcher)*. (43 species). Princeton University Exped. to Patagonia, VIII (1903), pp. 127-38.
- MAXON, W. R., *A study of certain Mexican and Guatemalan species of Polypodium*. Contr. U. S. Nat. Herb., VIII (1903), pp. 271-80. (2 pls.)

- POOLE, H. S., *On a polished section of Stigmara, showing an axial cellular structure.* Proc. Trans. Nov. Scot. Inst. Sci., X (Halifax, 1903), pp. 345-7. (2 pls.)
- R[OUY], G., *Sur l'habitat de l'Hymenophyllum tunbridgense Sm. et unilaterale Bory.* Rev. Bot. Syst. Geogr. Bot., I (1904), pp. 186-9.
- STOPES, M. C., *The Epidermoidal layer of Calamite Roots.* Ann. of Bot., XVII (1903), pp. 792-4 (fig.)
- TRABUT, L., *Sur la présence de Isoetes setacea Bosc. en Portugal.* Bull. Soc. Bot. France, LI (1904), p. 28.
- WEBER, E. A., *Der Duwock (Equisetum palustre L.).* Arb. Deutsch. Laudw. Ges. Heft 72 (1903), 71 pp. (3 pl.)
- WITTMACK, L., *Geschichte und Beschreibung des Adiantum Farleyense Moore.* Gartenflora, LII (1903), pp. 631-4, 643-4.
- ZEILLER, R., *Hymenophyllum tunbridgense dans la région de Cambo.* Bull. Soc. Bot. France, L (1903), pp. 590-2.
Bonn, Germany.

ADIANTUM CAPILLUS-VENERIS IN PENNSYLVANIA?

BY WILLIARD N. CLUTE.

Several times during the past decade, *Adiantum capillus-veneris* has been reported from various points in New York, Pennsylvania and Maryland. This species, however, is usually found in warmer climes and in consequence all reports of its growing so far north have been set down as due to errors of identification, the supposition being that young fronds of *Adiantum pedatum* have been mistaken for it. As far as mere latitude is concerned, a locality for the fern in New York would not be unusual, for the fern occurs plentifully at much higher latitudes in the Old World, and it has also been found in abundance in South Dakota. It would seem, therefore, that all reports of the finding of the fern in northern stations should be carefully investigated rather than dismissed with the statement that the report is due to a want of knowledge of the young stages of the common maiden-hair, as has been done by a writer in this journal.

These observations have been suggested by the fact that recently a small frond in fruit has been sent me for identifi-

cation, which is certainly *Adiantum capillus-veneris* and which the collector, Mrs. A. F. Scoullar, asserts was found at the Delaware Water-Gap, near Stroudsburg, Pa. The plants, several of them, were found east of the railroad station at the Water-Gap on the south side of the road through the gap. The spot is marked by a pile of small stones on the stone wall on the north side of the road. It is hoped that these directions will enable the next fern student who visits this place to also find the fern and to give us further notes concerning it.

When I received the frond my own impression was that it was a chance sporeling from some near-by greenhouse, but Mrs. Scoullar writes me that there were several plants and she knows of no greenhouse nearer than Stroudsburg. It may be remembered that I long ago reported the occurrence of *Nephrodium patens* naturalized in the mouth of tunnels in New York City which had undoubtedly arisen from wind-blown spores. On many old walls in that city may be found the prothallia of other ferns that rarely live long enough to produce a sporophyte. So it appears that the spores of various exotics are in the air and there seems no reason why one or more should not settle at the Water-Gap. Then the only question would be that of their ability to endure the winter.

INDEX TO CURRENT LITERATURE RELATING TO FERNS.

Readers are requested to call attention to any omissions from this list.

CLUTE, W. N. *A New Form of the Christmas Fern*. Fern Bulletin, Jl. 1904.

CLUTE, W. N. *Concerning Forms and Hybrids*. Fern Bulletin, Jl. 1904.

CLUTE, W. N. *Raising Prothallia of Botrychium and Lycopodium*. Fern Bulletin, Jl. 1904.

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CLUTE, W. N. *The Star Fern*. Fern Bulletin, Jl. 1904.

EATON, A. A. *Is Asplenium lanceum American?* Fern Bulletin, Jl. 1904.

EATON, A. A. *Isoetes Amesii*; a correction. Fern Bulletin, Jl. 1904.

EATON, A. A. *The California Gold Fern*. Fern Bulletin, Jl. 1904.

HAHNE, A. G. *Current Literature Relating to European Ferns*. Fern Bulletin, Jl. 1904.

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KELLERMAN, W. A., AND GLEASON, H. A. *Notes on Ohio Ferns*. Ohio Naturalist, N. 1904.

OSMUN, A. V. *Equisetum variegatum in Connecticut*. Fern Bulletin, Jl. 1904.

PARISH, S. B. *Additions to the California Fern Flora*. Fern Bulletin, Jl. 1904.

PRICE, S. F. *Contribution to the Fern Flora of Kentucky*. Fern Bulletin, Jl. 1904.

PRINCE, S. F. *Some Ferns of the Cave Region of Stone County, Missouri*. Fern Bulletin, Jl. 1904.

ROBINSON, C. B. *The Ferns of Northern Cape Breton*. Torrey, S. 1904.

WATERS, C. E. *Asplenium ebeneum proliferum*. Rhodora, O. 1904.

UNDERWOOD, L. M. *The Early Writers on Ferns and Their Collections—III*. Torrey, O. 1904.

EDITORIAL.

At last the long-expected index to the first ten volumes of THE FERN BULLETIN has been printed and is now ready for distribution. Its appearance calls our attention anew to the vast progress made in fern study during the decade that began in 1893. Much of this progress is directly traceable to the efforts of the Fern Chapter, one of the largest and foremost of the botanical societies in America, and the only one that does not depend upon regular meetings of the members to keep up an interest in its work; but much is due also, we take the liberty of thinking, to the encouragement to fern students afforded by THE FERN BULLETIN. It was most appropriate, then, that Mr. Gilbert should select the ten-year index of this journal as a fitting piece of work to signalize the completion of ten years of successful study by the Chapter. In addition to its usefulness as an index to this journal, the publication may be considered an epitome of what has engrossed the attention of fern students during the time covered by it. More than five hundred signed articles are listed, and in the species index no less than two thousand references to species are given, notwithstanding the fact that not a single reference has been made to mere specific names. The name of a fern may occur time after time in the magazine, but unless something definite has been said about the plant its name has been omitted from the index, thus saving the unnecessary labor of tracing mere names.

* * *

A look through the list of contributors shows that one hundred and eight persons furnished the matter for the first ten volumes. That there should be more than a hundred students sufficiently interested in ferns to write concerning them is itself remarkable, considering the nature of the requirements for such work. Of these writers few are credited with but a single article, while in some cases individual writers have contributed forty or more. The transitory interest taken in the subject of ferns is shown by the fact that several of the writers are no longer subscribers for THE FERN BULLETIN, nor known for their interest in ferns. Ten years, however, is a

long time for any individual to continue in a single line of work. Even the botanical magazines, themselves, rarely live longer. Of all the botanical magazines published when *THE FERN BULLETIN* was launched but two remain—*The Torrey Bulletin* and *The Botanical Gazette*.

* * *

To speak of the new publication as an "index" is rather to understate the case. It really is five indexes, an index to the signed articles, an index to all species about which something is written, a list of contributors, a list of illustrations, and a list of books and publications reviewed. It makes a pamphlet the size of this issue, and is bound in heavy paper covers. We understand that a copy is to be sent free to all old members of the Fern Chapter whose dues are paid for 1905.

* * *

At the end of the year it has been customary for us to outline something of the contents of the coming volume, and we take the occasion at this time to say that the journal for 1905 will be in all respects up to the usual standard. There has been a great demand for the fern-floras of the States, and this popular feature will be continued. The floras for Ohio, Illinois, New Mexico, Georgia, Mississippi, Connecticut, Vermont, Pennsylvania and Massachusetts are under way and will be published in the order in which they are completed. It should be a matter of pride to residents of the various States to have their own flora published as early as possible. It serves as a basis upon which further work can be done, and greatly aids in defining the distribution and abundance. We shall also continue the descriptions of exotic ferns. The plates to illustrate the series for 1905 have already been made. As to the bulk of the magazine, we expect it to come as usual from the contributions of our readers. As the journal grows older there is a tendency for many to refrain from contributing, possibly because they imagine they can write nothing of interest to others; but it does not need a technical education to see interesting things in ferns, and we trust that beginners will claim their full quota of space.

With this issue, bills are sent to all whose subscriptions have expired. To guard our old subscribers from loss of numbers between expiration and renewal of subscription, it is our custom to send the magazine until ordered stopped. If there are any who do not wish to renew, we request that they notify us at once. While the editor is away from home part of the time, the magazine may appear behind its usual dates, but readers may be sure of receiving, as they have for the twelve years past, the full number of issues for their money.

BOOK NEWS.

The Atlantic Slope Naturalist, which began publication about two years ago, has ceased to exist.

American Gardening, one of the oldest of American horticultural journals, recently suspended publication.

The American Botanist has begun the issuing of colored plates, one of which now appears in every other number.

The exact title of the ten year index is "A Complete Index to Volumes I-X of *The Fern Bulletin*." It is sent postpaid for 25c or is given free with an order for a set of the back numbers of *THE FERN BULLETIN*.

It is expected that a new list of the ferns and fern allies of North America north of Mexico will appear early in the year, recent discoveries having made all the other lists incomplete. The new list will give common names, synonymy, and full and careful notes on distribution.

We have recently received from the author a copy of "A Nature Wooing," which recounts in an entertaining way the adventures of a naturalist during a winter in Florida. The author is W. S. Blatchley, State Geologist of Indiana, and his book is one that is well worth reading by all who visit the Southern States in pursuit of the outdoor life.

America is not unique in its wave of publications upon outdoor subjects. Our cousins across the Atlantic have even a larger list to select from than we have, and the supply of new works is undiminished. One of the most interesting of these is

Step's "Wayside and Woodland Trees,"† a neat little volume of 175 pages, designed to fit the pocket and serve as a guide to British trees. There are 127 full page plates from photographs showing each tree as a whole, with additional views of its trunk at short range. Each tree is carefully described and much about it that is interesting noted, and the text is further supplemented by fifty drawings of flowers and fruit. The book is an excellent one for comparison with our own flora.

The welcome accorded the first edition of Captain McIlvaine's "1000 American Fungi,"* has lead the author to issue a second edition which in all respects is equal to the first, but which costs much less. The book deals with the principal edible and poisonous mushrooms or toadstools and includes an account of the puffballs and allied fungi. Contrary to the general opinion a large number of the so-called toadstools are edible—Captain McIlvaine has himself tested about five hundred kinds—and these are carefully described and well illustrated. There are one hundred and eighty-two plates, many of them colored, besides other illustrations in the text. The book is one that will interest every eater of fungi, and one that all who can should own.

†"Wayside and Woodland Trees." By Edward Step. F. Warne & Co.: London and New York. 1904. \$1.75 net.

*One Thousand American Fungi. By Charles McIlvaine and Robert K. Macadam. Indianapolis: The Bowen-Merrill Co. Small 4-to. 729 pp. \$5.00 net.

THE LINNEAN FERN CHAPTER OF THE AGASSIZ ASSOCIATION.

—Dr. C. E. Waters has changed his address to Bureau of Standards, Washington, D. C.

—Owing to a pressure of other duties, Mr. Homer D. House has been obliged to resign as Secretary of the Chapter. His work has been taken up by the newly elected Secretary, Mr. A. Vincent Osmun, whose address is Amherst, Mass.

—Members of the Chapter who would like specimens of *Lycopodium Chapmani* (*L. adpressum*) and *Woodwardia areolata* from the District of Columbia, may obtain them by sending six

cents for postage to Homer D. House, National Museum, Washington, D. C.

—No regular meeting of the Chapter will be held this year in affiliation with the American Association for the Advancement of Science, but since several members of the Chapter are likely to be present, an informal meeting is proposed. The Association meets in Philadelphia, December 27 to January 2. All fern students who are likely to be present will be given further particulars upon application to Secretary Osmun.

—The twelfth annual election of the Chapter, held in October, resulted in the selection of the following officers for the year 1905: President, James H. Ferris, Joliet, Ill.; Vice-President, Dana W. Fellows, Portland, Maine; Secretary, A. Vincent Osmun, Amherst, Mass.; Treasurer, C. F. Saunders, Philadelphia, Pa. This is the first time in the history of the Chapter that the presidency has gone to a candidate west of the Atlantic States. Since all business is done by correspondence, however, geographical position is of no consequence so long as good officers are secured. A full report of the election will be given in the Annual Report soon to be issued.

—We have recently received from Mr. H. E. Ransier, Manhus, N. Y., three very fine photographs showing *Scolopendrium* and *Pellaea* at Green Pond, near Jamesville, N. Y. It is not an easy task to photograph scores of plants of *Pellaea gracilis* so that even the pinnae may be distinctly seen, but Mr. Ransier has accomplished it.

TO BEGINNING STUDENTS

Many who take up recent issues of THE FERN BULLETIN find them too technical for easy reading; but it should be remembered that the magazine has grown technical as it advanced in years. The early issues are much less technical, though none the less accurate, and the articles, written mainly by beginners, deal with topics chiefly of interest to beginners. One should not overlook the series of "Helps for Beginners" in which a large number of our ferns are illustrated and described; the series on *Equisetums*, in which every species in North America and all the varieties are described; the eighteen portraits of fern students, including portraits of D. C. Eaton, G. E. Davenport, L. M. Underwood, B. D. Gilbert and the authors of all American books on ferns. At 25 cents each, these portraits would amount to more than we ask for a set of the magazine. Since the journal was established great additions have been made to our knowledge of ferns, and these back numbers contain an immense amount of information regarding extensions of range and fern habits that can be found nowhere else. A large number of new species and forms are also described. The series of Fern-floras recently begun are of themselves worth the price of subscription. Inquire of any old fern student and you are pretty certain to find he has a file of the FERN BULLETIN as complete as he can get it. The first five volumes are now out of print. Volume 6 is nearly so. Order in time. Note the following prices:

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From a letter, written under date of December 25th, 1903, we quote the following: "I wish to state that the Bausch & Lomb microscope which I purchased from you a year ago last August, and the eye-pieces and objectives, have all proved very satisfactory indeed, and though second-hand when purchased, I find them as good as new on testing them."

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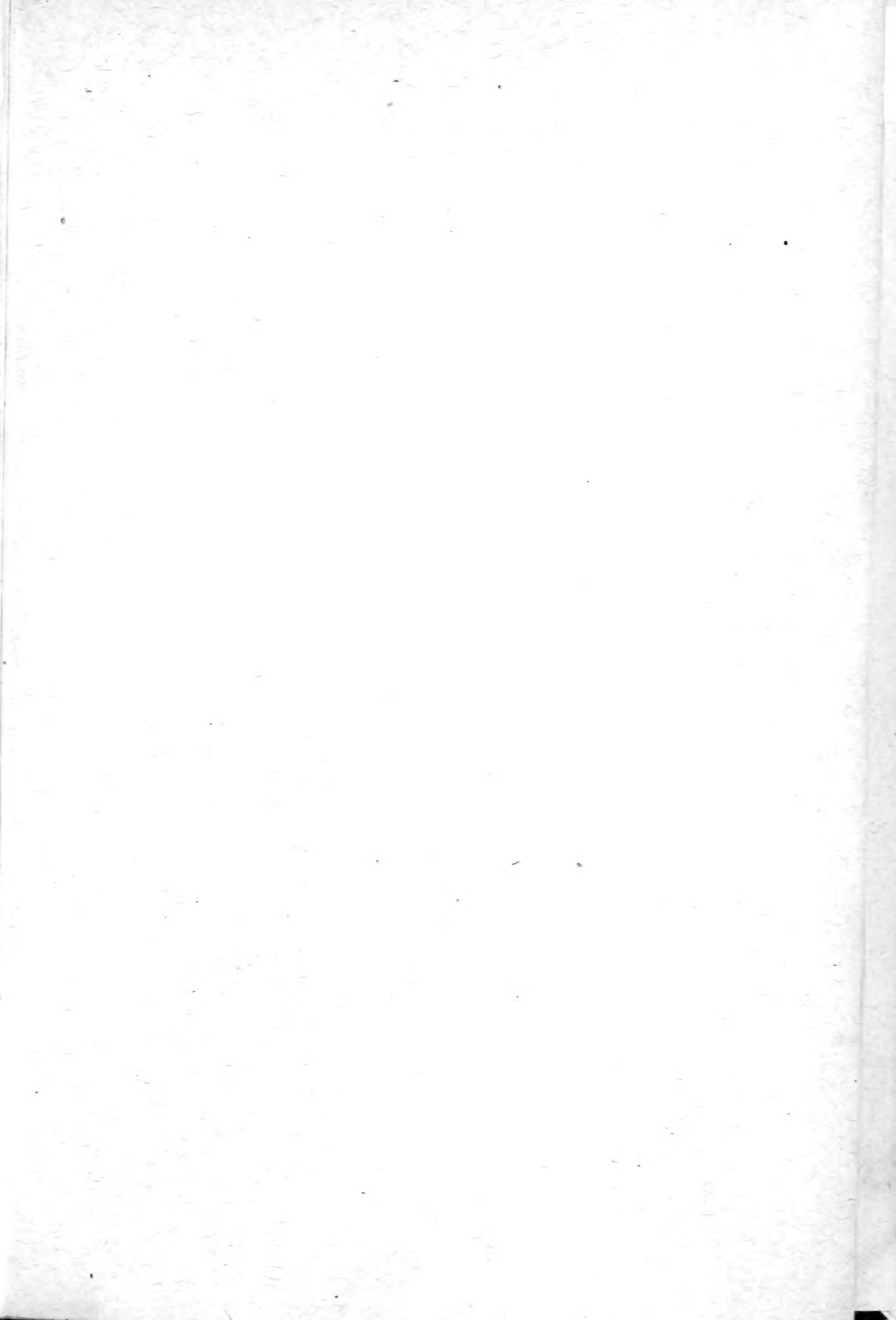
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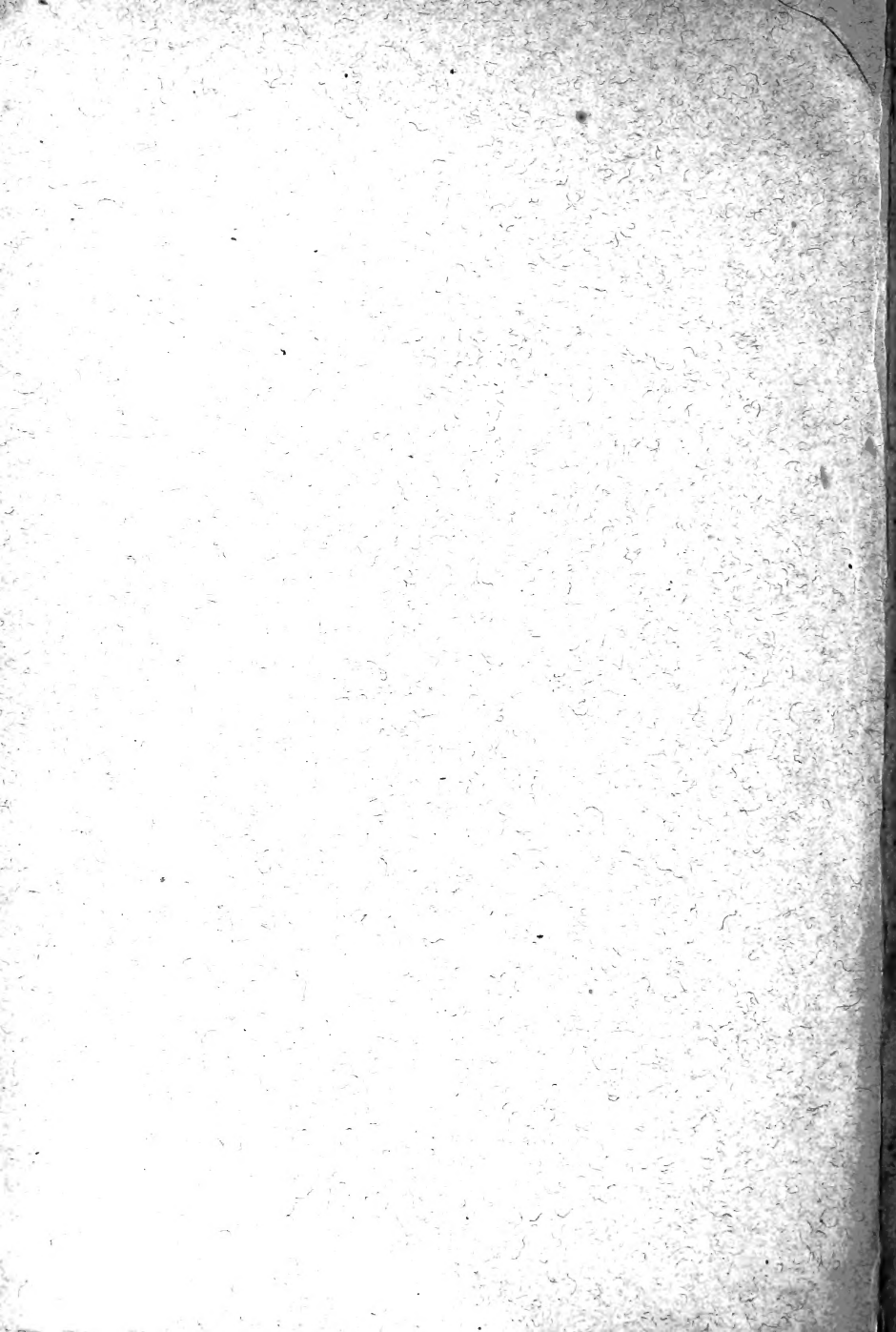
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